Rochester Regional Photonics Accelerator

All Hands Meeting

April 24, 2013


Manufacturing Jobs in Rochester MSA
Jobs (1000's)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010

In the News
Today - April 19,2013

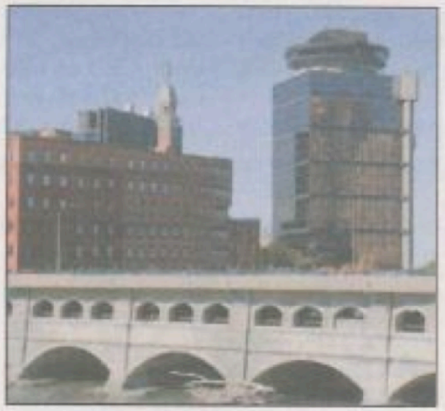
Report: Job sprawl hits area

The Brookings Institution says downtown area lost 26,000 jobs over 10 years

By VELVET SPICER

The downtown area took the brunt of the job losses in Rochester during the first decade of the millennium, and this area was the upstate region hit hardest by job sprawl, a new report from the Brookings Institution shows.

Of 28,885 jobs lost by the Rochester metropolitan area from 2000 to 2010, more than 26,000, or roughly 90 percent, were concentrated within three miles of the central business district. The area three to 10 miles from downtown lost nearly 6,000 jobs during the decade, while the area 10 to 35 miles from the central business district gained roughly 3,300 jobs, the report shows.



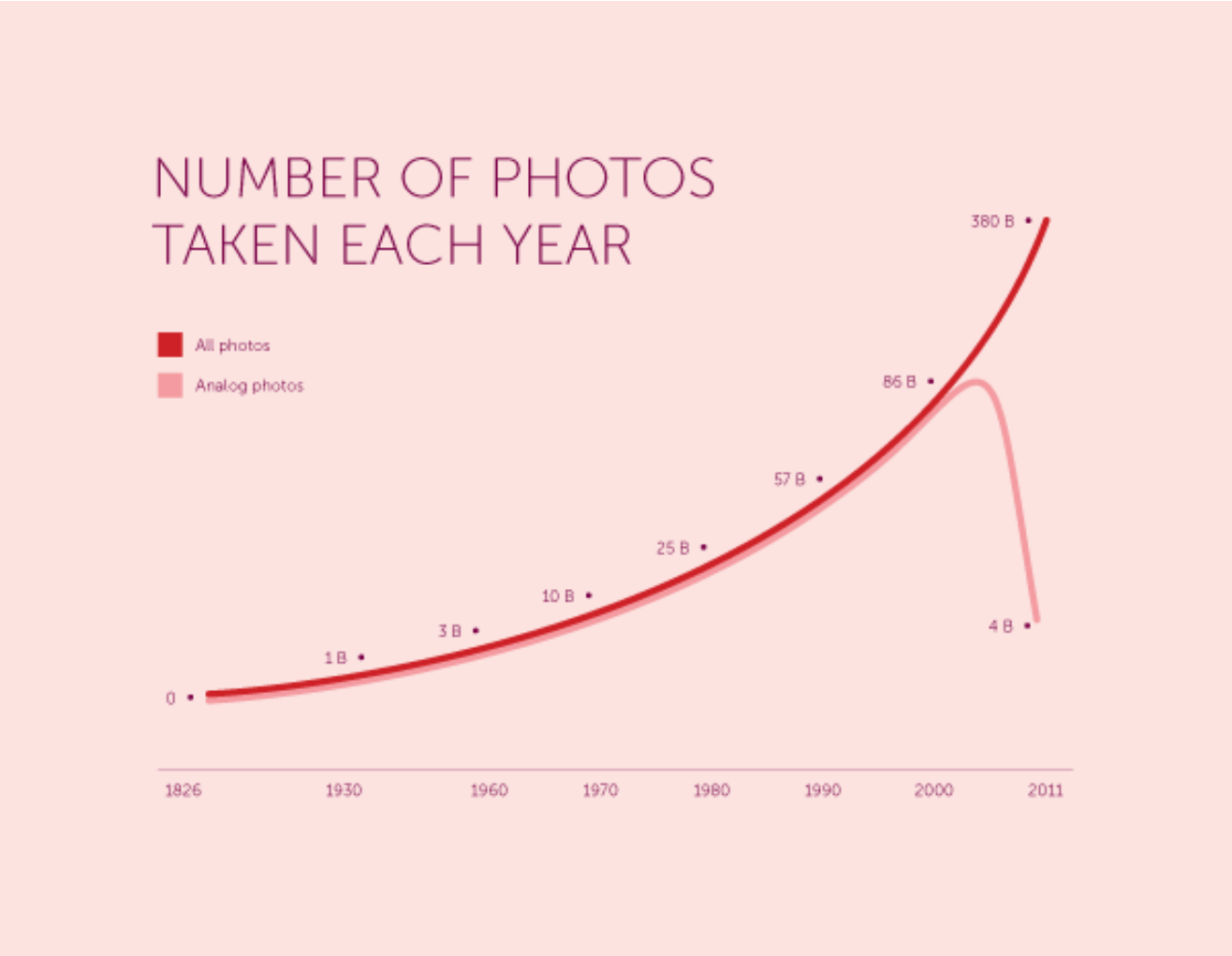
File photo

The area three to 10 miles from downtown lost nearly 6,000 jobs from 2001 to 2010.

Job sprawl—an increase in the share of

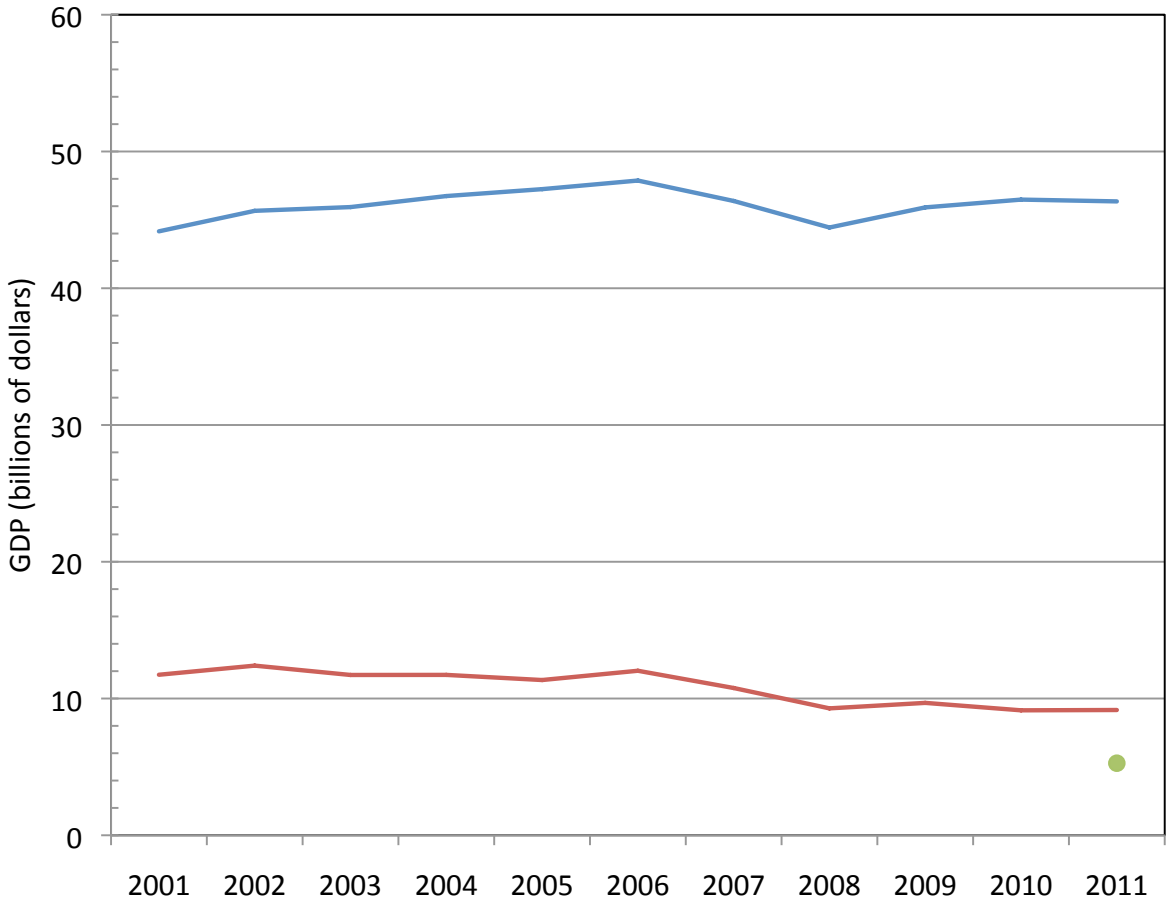
Continued on page 16

The Future of Imaging



Smart mobile devices + advanced imaging technology + wireless connectivity + the internet = we are limited only by our imagination.

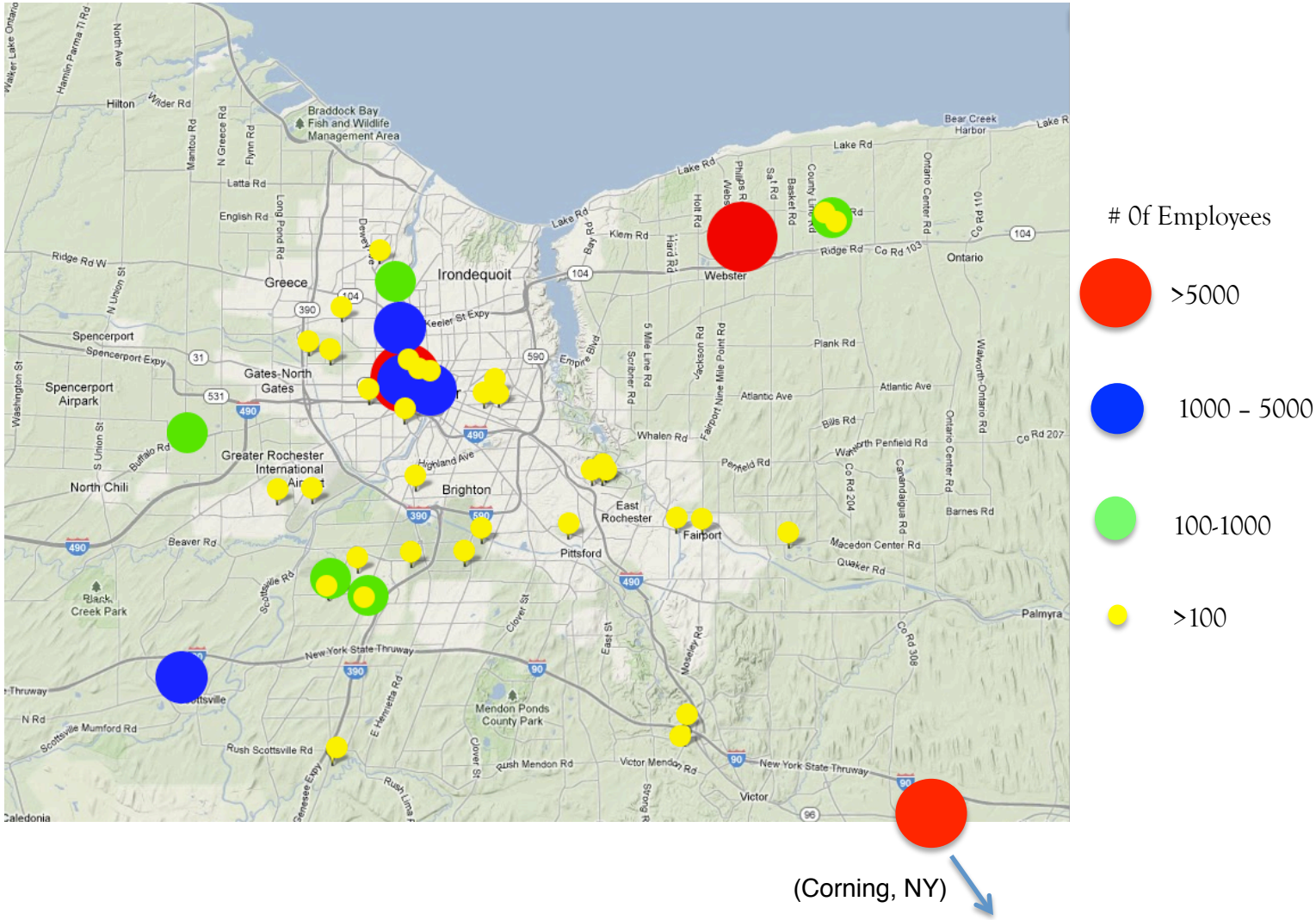
Rochester MSA GDP (2011 dollars)



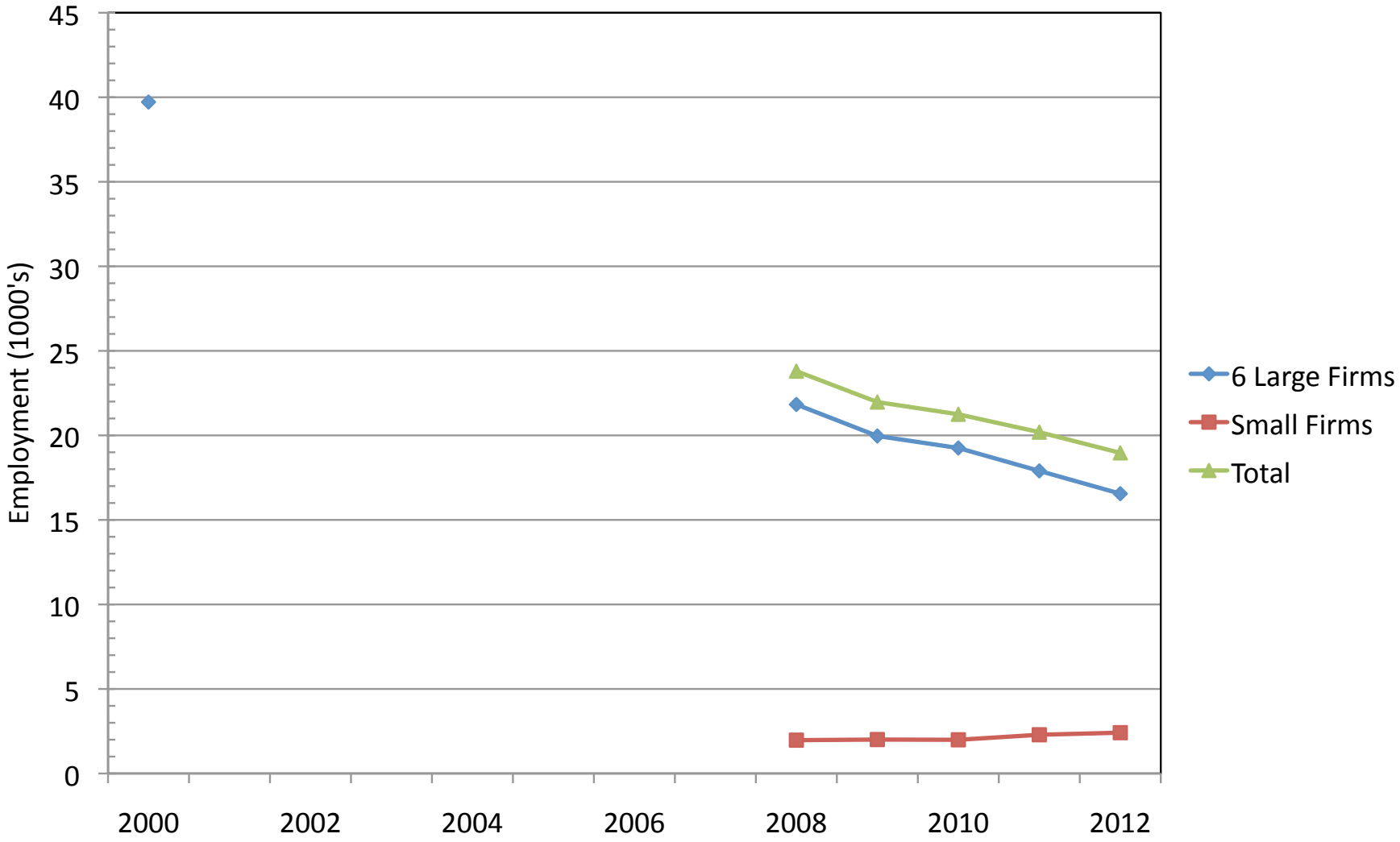
Manufacturing has historically made up about 25% of the Rochester GDP but that is now down to 20%. Rochester stil accounts for 1/7 of the state's mfg. output

In 2011 the optics, photonics, and imaging sector accounted for $5.3B of that, or about 57% of the region's total

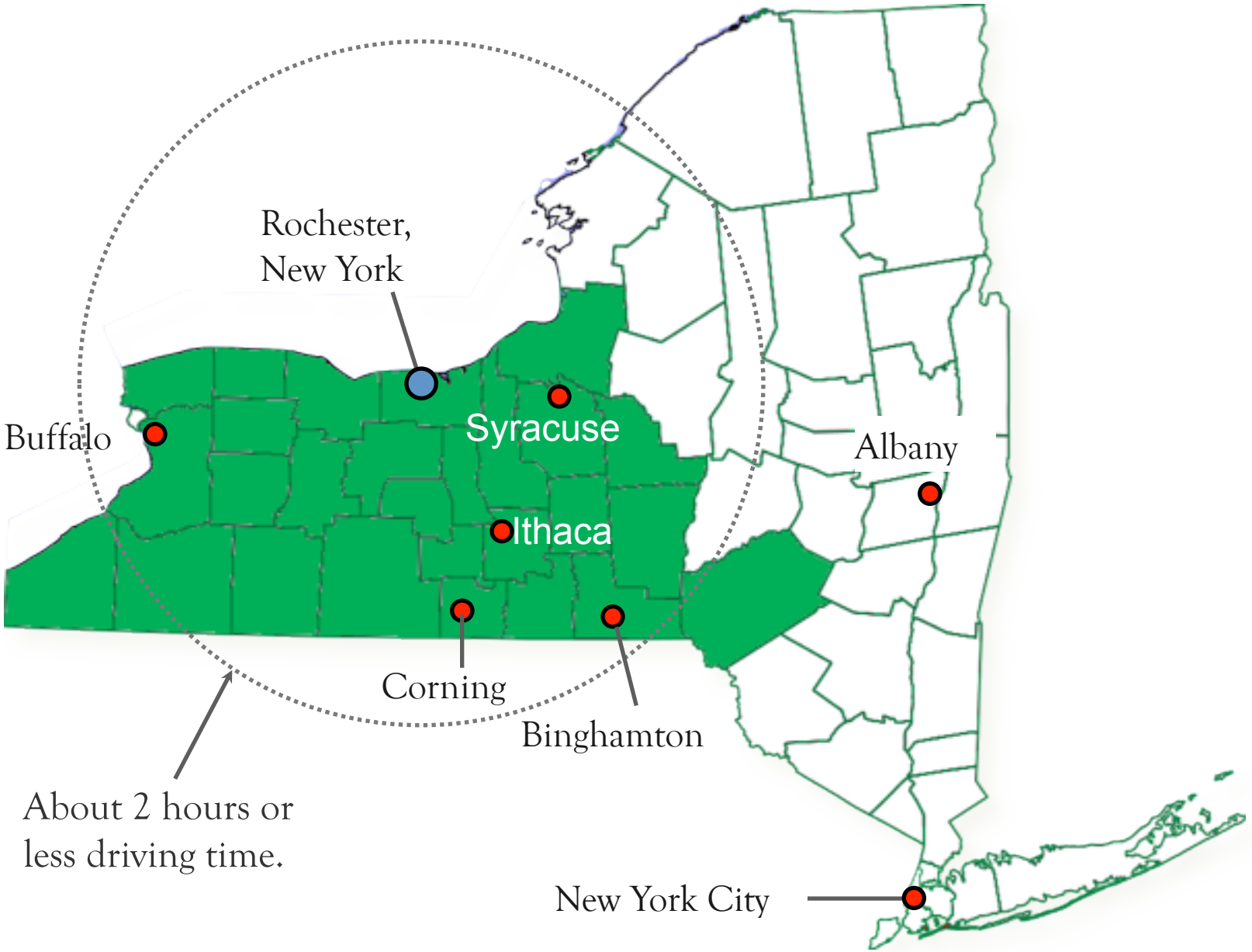
Rochester OPI Cluster (~60 Companies)



OPI Employment in Rochester



New York Photonics



KODAK, TEXAS FIRM TO MAKE SENSORS HERE

Wade Grisenthwaite, from Dayton, Pa., takes down lighting in Eastman Business Park Building 326 on Tuesday. Kodak will partner with UniPixel Displays Inc. of Texas to manufacture touch screen sensors at the Greece location. SHAWN DOWD/ STAFF PHOTOGRAPHER

It's part of focus on functional printing

Matthew Daneman
Staff writer

Eastman Kodak Co. is turning part of Eastman Business Park currently used for motion picture film manufacturing into a plant for churning out sensors printed on thin polyester film as part of a joint arrangement with a Texas technology company.

Kodak and UniPixel Displays Inc. announced Tuesday they had signed a joint manufacturing and supply arrangement that will see the two putting up $24 million to convert part of its mammoth, million-square-foot Building 326 into a plant for touch screen sensors.

The joint operation is expected to be up and running by fall and employ 65 to 75 people, said Kodak spokesman Christopher Veronda. The people will largely be transferred from other Kodak operations, such as film manufacturing, Veronda said: "This creates an opportunity for us to place people who are highly skilled."

The UniPixel arrangement comes as Kodak, which is getting out of the photography business and focusing on commercial printing, has pointed to such "functional" printing as a key part of its future. Functional printing involves using printing technology as a means of manufacturing such items as circuit boards or solar cells.

"Functional printing is a key growth area for Commercial Imaging," Kodak CEO Antonio M. Perez said in a state-

See SENSORS, Page 6B

They're back: Kodak workers to get bonuses

Staff reports

Car dealers and appliance stores may have reason to rejoice: Eastman Kodak Co. announced Tuesday it is bringing back bonuses for all employees.

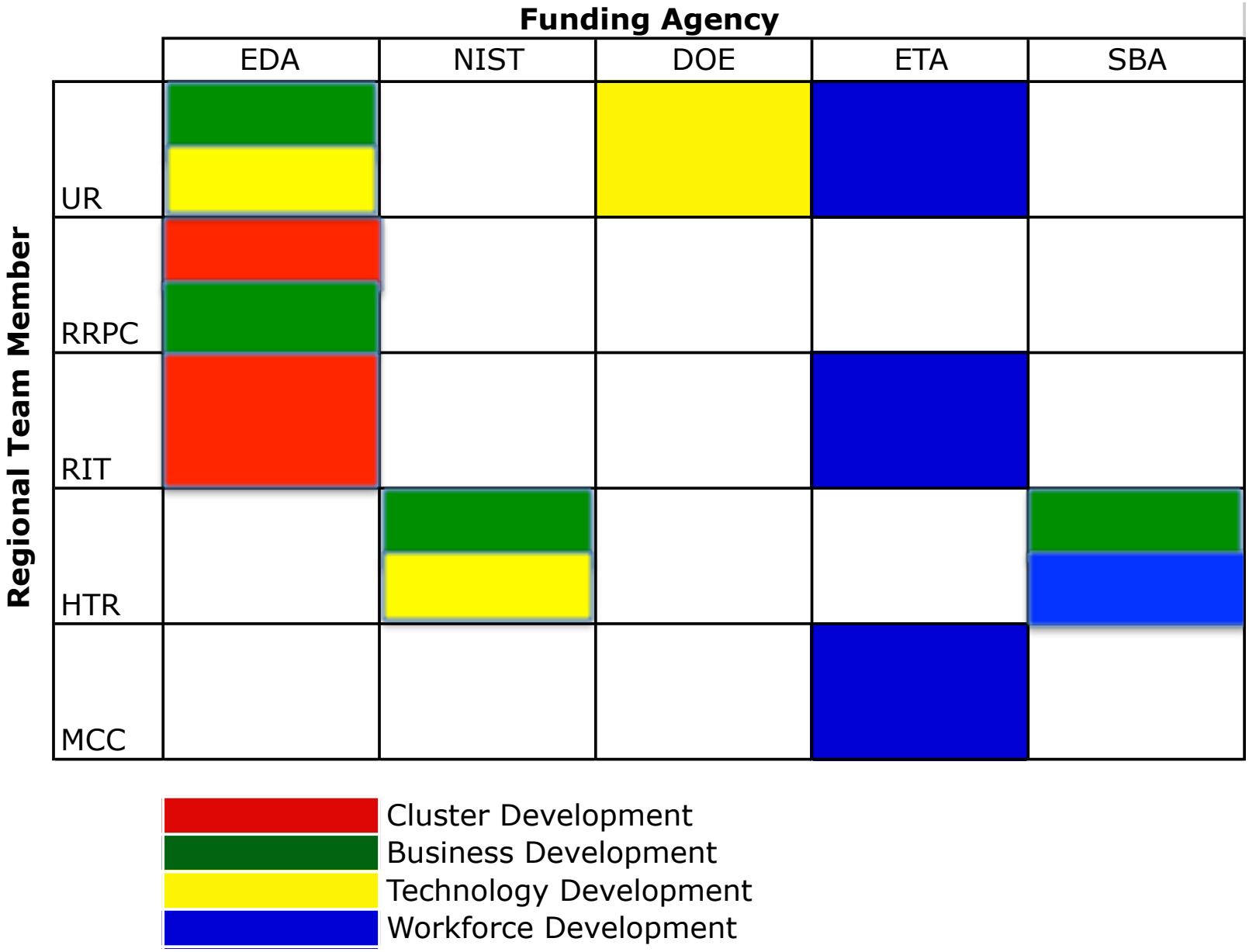
Kodak spokesman Christopher Veronda said hourly employees will receive a 5.5 percent bonus, based on their 2012 income, on April 25. Exempt and executive employees will receive variable pay plan bonuses, he said, with the payout to be based on performance against personal and corporate

See BONUSES, Page 6B

RRPA Program Summary

- The RRPA program seeks to strengthen the Rochester regional optics, photonics, and imaging cluster and accelerate the creation of jobs.
- The program brings together 5 regional organizations in an unprecedented way to form a coordinated and comprehensive approach to strengthening the OPI cluster
- We work through a combination of cluster development, business development, technology development, and workforce development.
- Our primary focus is on the 50+ SME OPI companies in this region.

RRPA Teaming Arrangement



Agenda

- **Overview of Program** – P. Ballentine
- **EDA**
  - Cluster Development – T. Battley
  - Technology Development (RIT/B+L) - K Maki and D. Ross
  - Technology Development (UR MechE) - J. Lambropolous
- **NIST (MEP)** – T. Debellis
- **DOE**
  - Freeform optics design – J. Rolland
  - Polishing slurry recycling – S. Jacobs

Agenda (cont.)

- **ETA**
  - UR Summer School - P. Ballentine
  - RIT Foundations of Imaging Science – S. Farnand
  - RIT opto-electronic devices, packaging, and assembly – D. Mawyer
  - RIT opto-electronic component fabrication – M. Jackson
  - Course enrollment process and registration status – A. Brengle
- **SBA** – M. Reidlinger

EDA

Rochester Regional Photonics Cluster EDA Project

This project consists of three objectives intended to help make New York State's photonics, optics, and imaging sectors more competitive in the global marketplace:

1) Promote the region's Optics & Photonics Industry
2) Promote Cluster Development in the nine-county region
3) Collaborate with stakeholders to help OPI industry members identify and enter new markets and improve business practices

PHOTONICS ROCHESTER

Progress

- Organized the New York Pavilion at Photonics West 2013, and currently organizing the 2014 pavilions at Photonics West and Defense, Security & Sensing
- Unveiled new RRPC website, with a built-in "solution finder" function
- Ongoing professional development meetings: Managing sales staff; maximizing R&D Tax credits; using social media and other marketing tools; preparing for next year's health care plan
- Added three new members: Empire Precision Plastics, Navitar, Volpi USA
- Assisting a possible new manufacturing operation locating to Rochester

PHOTONICS ROCHESTER

New York Pavilion for PW 2014

PW 2013

PHOTONICS ROCHESTER

R·I·T

Rochester Regional Optics,
Photonics & Imaging Accelerator (RRPA)

Project: Mathematical models for efficient contact lens design
April 24, 2013

Kara L. Maki,
Assistant Professor of Mathematics, RIT

and

David S. Ross,
Professor of Mathematics, RIT

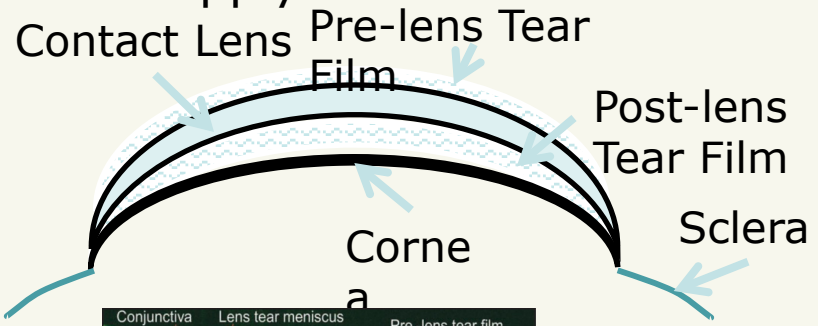
BAUSCH + LOMB

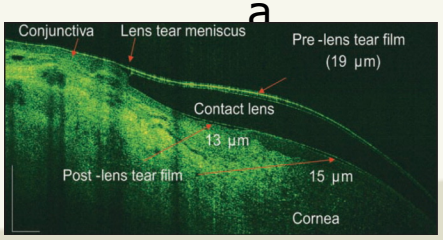
E·D·A
U.S. ECONOMIC DEVELOPMENT ADMINISTRATION

ROCHESTER INSTITUTE OF TECHNOLOGY

Project Description

- Develop a mathematical model of the suction pressure in the post-lens tear film behind a contact lens. Develop a computer program based on the model that can compute such suction pressures.
- Apply the model to the analysis of realistic radially-symmetric contact lenses.
- Generalize the model to apply to non-radially-symmetric lenses. Include the fluid dynamics of the tear film. Apply this model to the lens-tear-eye problem.
- Integrate the mechanics model with optics.
- This project will help improve the comfort of contact lenses, which should enlarge the population of contact lens consumers. The project will reduce the trial-and-error involved in contact lens design.





Wang *et al.*, OSLI (2011)

Progress for 1st Quarter:

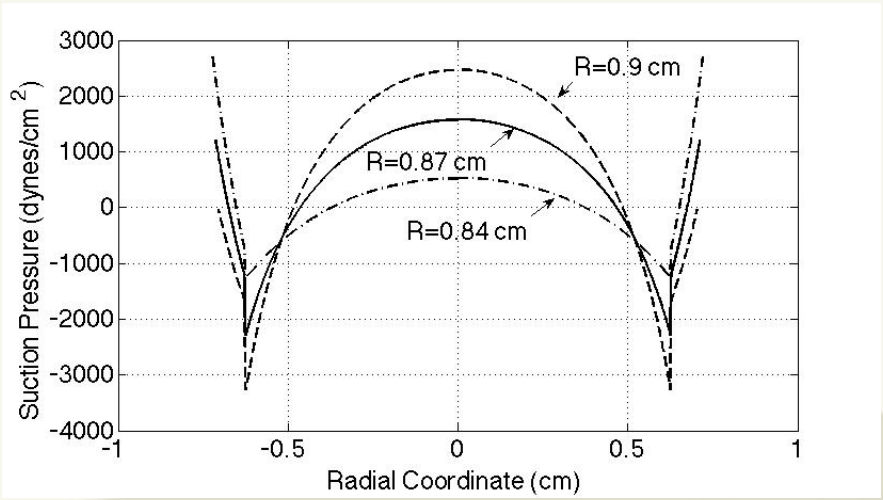
Development of the Model/Code and Testing of the Code

- We have defined a mathematical model for the suction pressure under a radially-symmetric contact lens, and for the stresses inside the lens, as functions of the lens's shape and its elastic properties and the shape of the eye.

- We have written and tested a computer program based on the model.

Design parameters:

- Thickness of the lens
- Shape of the lens
- Lens material



R·I·T

Publications and Presentations

- We submitted a manuscript on the model, *A Novel Model for the Suction Pressure Under a Contact Lens*, K. L. Maki and D. S. Ross, to Journal of Biological Systems.

- We presented a poster, *Computation of the Suction Pressure under a Radially-Symmetric Contact Lens,* at the CEIS University Technology Showcase, Doubletree Hotel, 3/26/13.

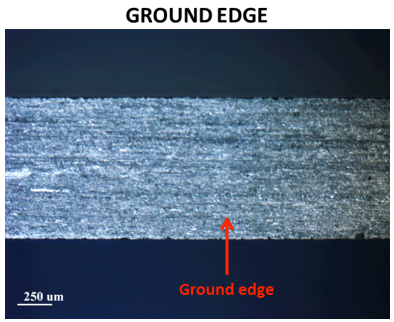
- K. L. Maki was selected to participate and present this work at the Fifth-Indo American Frontiers of Science Symposium co-sponsored by the National Academy of Sciences held in Agra, India.

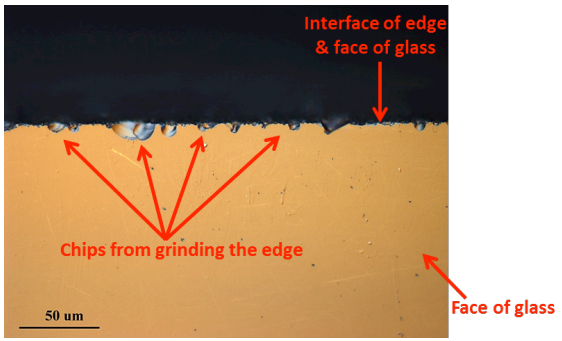
- RIT biomedical engineering student Emily K. Holz is currently being trained.

Applied Research on CNC Grinding, Finishing, and Optimization

John C. Lambropoulos
Dept. Mechanical Engineering
University of Rochester

RRPA All Hands Mtg, Wed., April 24, 2013,
Univ. of Rochester



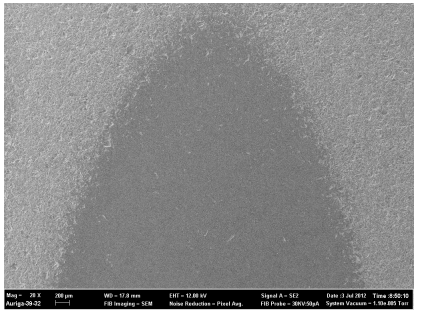


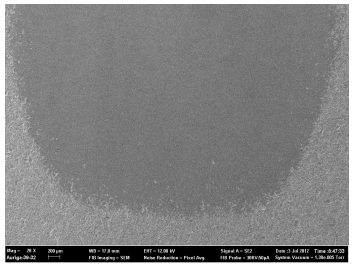
Applied Research on CNC Grinding, Finishing, and Optimization

Robust estimates of subsurface damage (SSD)under CNC grinding conditions

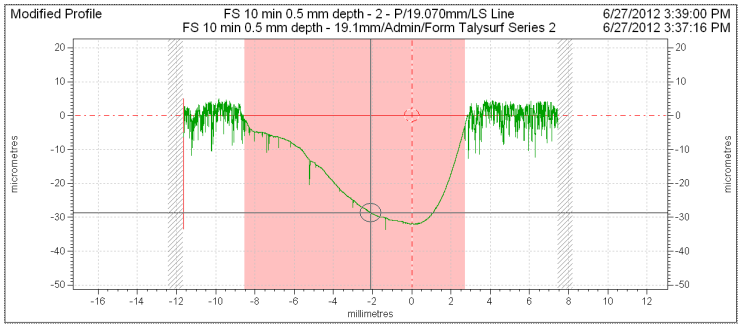
of SURFACES

of EDGES





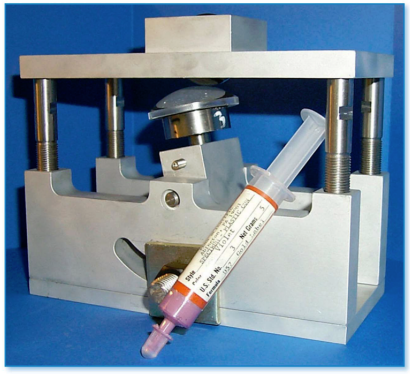
- Measure, model, correlate, therefore PREDICT SSD.
- Basic idea: How much material to remove in a <u>subsequent finishing</u> process depends on how much SSD has been induced in a <u>previous grinding process.</u>



Project Deliverables & Economic Impact Objectives

Project Deliverables

- Advanced undergraduates applied research projects.
- 3-6 students per year.
- Possibly 1 MS student per year.
- Mech E majors with optical manufacturing hands-on project work.

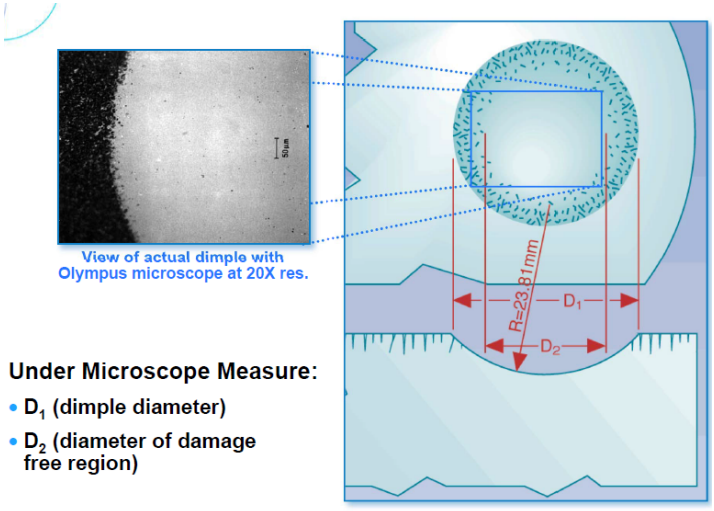


COM Ball Method
SSD dimpling fixture
for samples

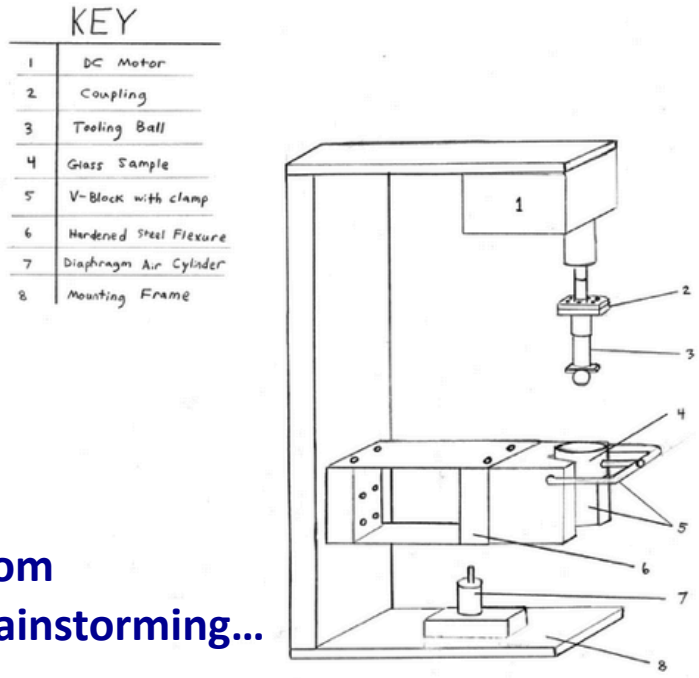
EI Objectives

Enhanced graduating student skills: Combined mechanical engineering with optical manufacturing skills.

Progress shared with member companies.

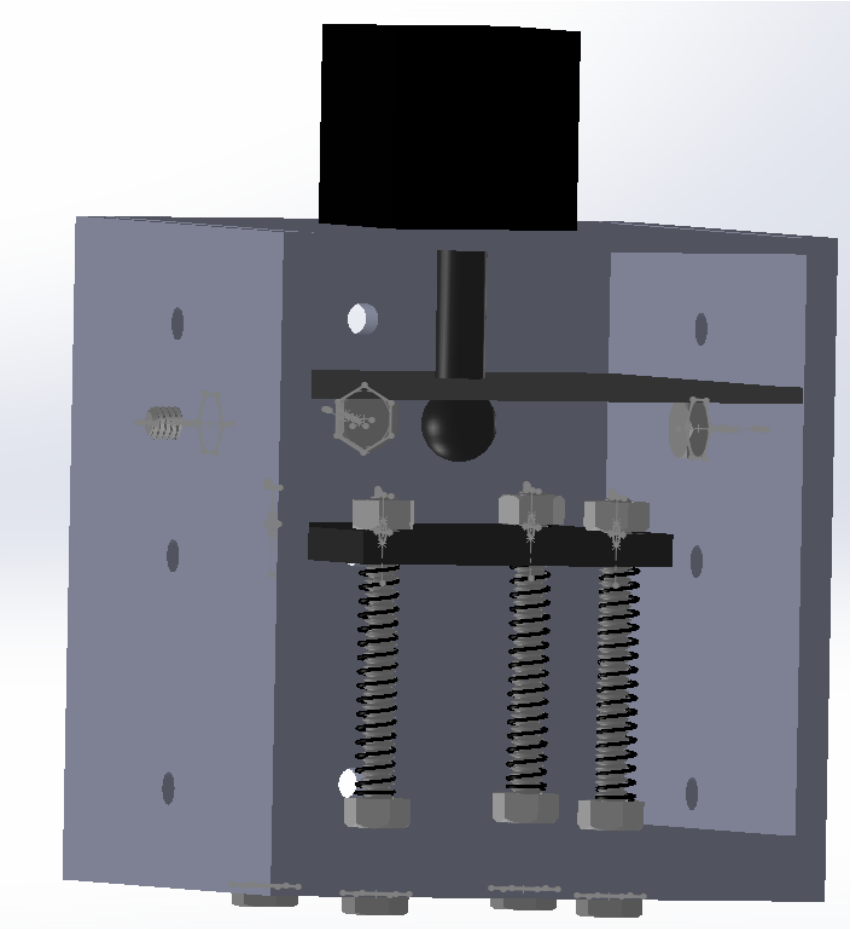


PROJECT 1 **Senior-level advanced mechanical design undergraduate project to design desk-top apparatus to measure subsurface damage in ground optical surfaces. (Meghan Neff, Sam Marchetti, Greg McKiernan; prototype by May 2, 2013)**



From brainstorming…

To CAD…



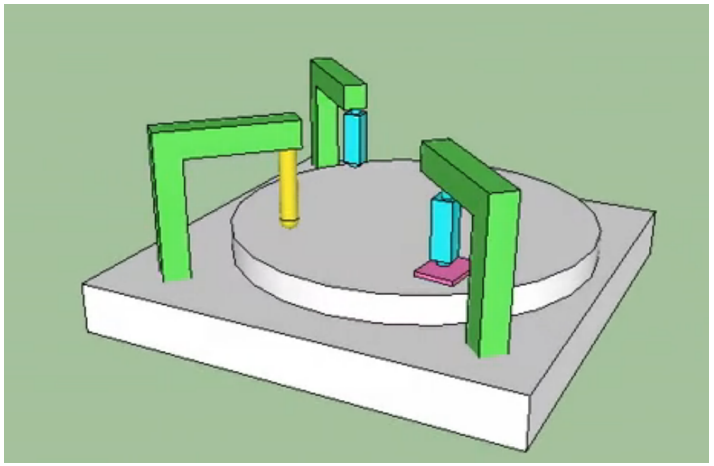
To prototype…in 3 months

PROJECT 2 **Automated Sub-surface Damage Measurement Device [ASDMD] Technical Entrepreneurship**

(TEAM) MS team have also designed a similar prototype w/ on-board optical microscopy, and created an *assessment questionnaire for input from many local optics manufacturing companies*. (Tejas Khire, Koye Alaba, Brian Charles, Karan Mehrotra)

PRODUCT VISION A portable and inexpensive device for automated & accurate measurement of sub-surface damage on optical glasses and ceramics.

- ***Small footprint***
- ***On-board metrology***
- ***Interfaced to a computer using Matlab or LabView***



PROJECT 3 MS-level precision grinding and finishing research, using Optipro SX-50 and UFF CNC platforms (Dennis Briggs, advised by Prof. Ellis) MechE Precision Optics fab Lab

SX 50 MACHINING SYSTEM Computer-Numerically-Controlled optical machining system. Five controllable axes: X, Y, Z, B & C with up to 5 axes of simultaneous movement. Fagor 8070 CNC machine controller, with a high-resolution LCD touch screen monitor. Capabilities include machining/grinding of plano optics, spheres, and axisymmetric aspheres.

ULTRAFORM FINISHING (UFF) SYSTEM Computer-Numerically-Controlled sub-aperture polishing system. Five controllable axes: X, Y, Z, B & C with up to four axes of simultaneous movement. Fagor 8070 CNC machine control with a high-resolution LCD touch screen monitor. Capabilities include finishing of plano, spheres, and aspheres as well as freeform optics.

NIST MEP

HIGH TECH ROCHESTER
innovate. incubate. grow.

HTR GROWTH SERVICES

- Assembled a list of current companies and the top level contacts within the cluster that we will or have approached for assessment.
- Outreach activities for the past quarter included interviewing 14 companies face to face for grant selection opportunities.
- Have confirmed one contract with three additional outstanding.(Sydor, PRP, Syntec and JML)
- Discussed developing round table topics focused around cluster needs and goals.

DOE

Rochester Regional Optics,
Photonics & Imaging Accelerator (RRPA)

University of Rochester
DOE # DE-EE0006033

Project 1: Freeform Optics Development
Status Report
April 24, 2013

Jannick Rolland
Brian J. Thompson Professor of Optical Engineering, Professor of Optics and Biomedical Engineering, Professor in the Center for Visual Science, U of R
and
Martin Huarte-Espinosa, Ph.D.
Research Associate, U of R

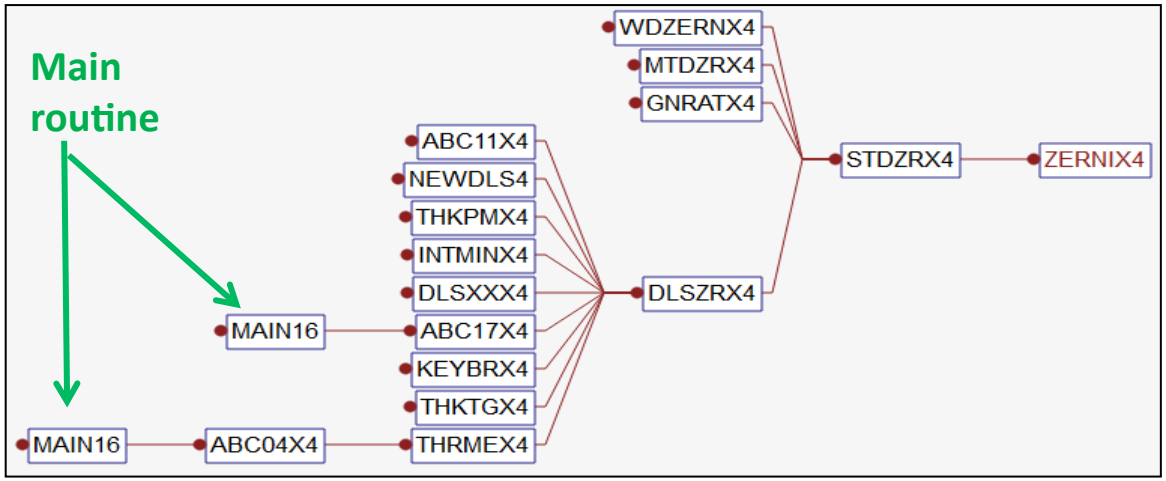
Project Description

- Develop a freeform optical design environment that enables rapid transformation to the manufacture and test of the leading optical surface fabricators.
- This novel broad foundational optical design environment will allow the fabrication, assembly, and testing industry to anticipate, innovate, and retool for the future of optical systems.
- The U of R is in a position to initiate the introduction of this transformational technology into existing regional global leaders in the development of new optics technology.
- Develop of freeform optical surface design and analysis methods, optical testing methods for freeform surfaces, and optical alignment of fully non-axisymmetric optical systems.
- This effort will propel the US industry to the leadership position in this expansive new technology.

Progress for 1st quarter: January-March 2013

Task P1.1.1 Global Mapping of the Core Software Engine

- We have been developing entity relationships and graphs of the code base using static source code analysis tools (i.e. UNDERSTAND). This allow us to access the desired part of the code (e.g. there are many channels though which the code accesses the computation of the Zernike polynomials of an optical system, see image) -in progress (20%)



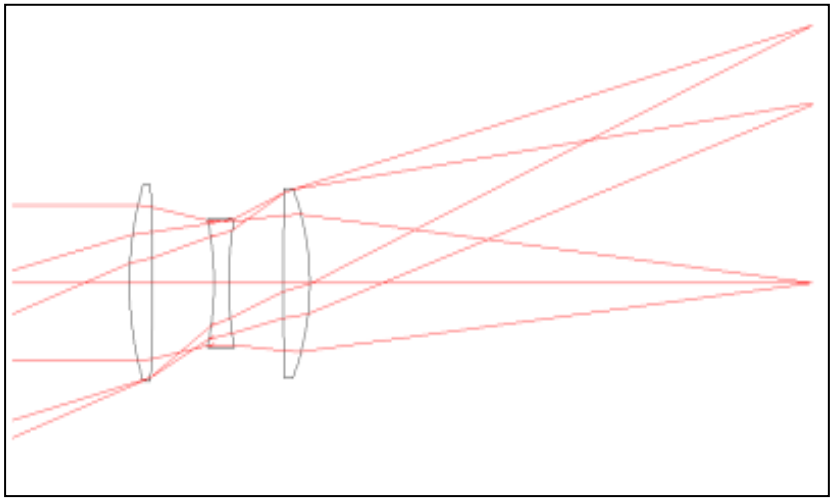
An example path to reach Zernike Polyn. Routine (6 steps)

- We are working on opening the code to fully exploit its engine - begun
- A document describing the relevant code's functions and variables, as well as their interactions and external access points, will be the result of this task - begun

Progress for 1st quarter: January-March 2013

Task P1.1.2 Graphics Interface Selection

- Libraries: Graphics open source code base *dislin* identified & installed - done
- Dislin has been integrated into the existing code to provide an expansive and effective user interaction - done

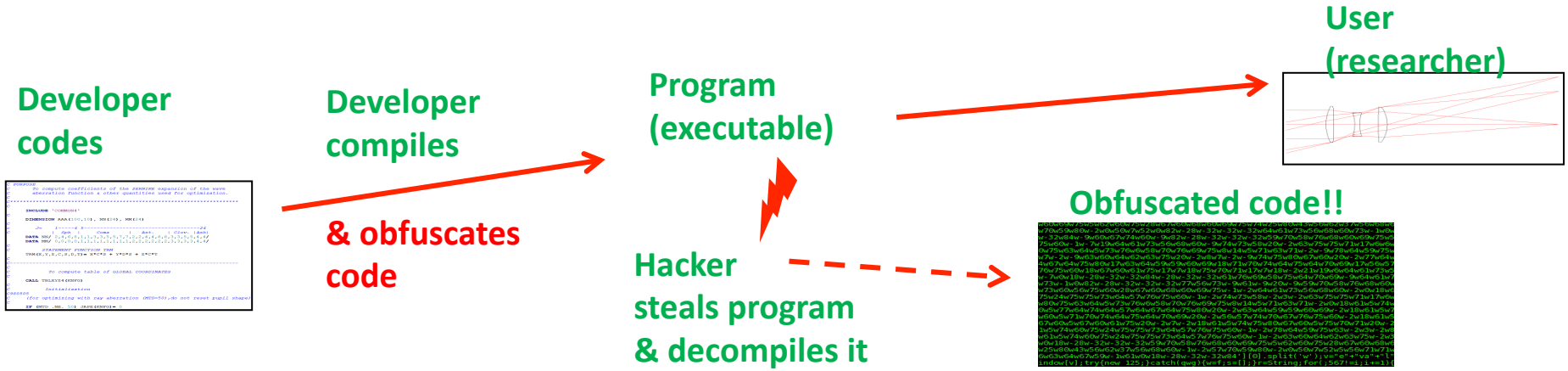


- Testing dislin's communication capabilities with the optics code base (Eikonal+), as well as its use for optical systems displaying - in progress (Image shows a dislin's first output for spherical lenses set of rays with different incident angles, the trajectories of which are affected by the lenses)
- Future testing with more complex lenses will be particularly useful for the emerging concepts associated with freeform optical surface technology; design, fabrication, and testing - begun
- Outside user: developing a graphical interface in C# to read & use specification and computations from Eikonal+ and produce users own graphs and work - in progress

Task P1.1.3 Code Security Design

- Initial talk on the paths to take to ensure the optics code base portability without compromising its intellectual property - planned

- Plans to implement a simple approach
  - restrict researchers to accessing the compiled code base. Links to researcher specific code will be created by the computer science developers in our team only and only the PI will retain source access beyond this developer staff.
  - obfuscation (to conceal the code's purpose or its logic, in order to prevent tampering, deter reverse engineering)



Progress for 1st quarter: January-March 2013

Publications and Presentations

- "Eikonal+: A simulation platform for innovative research in optical instrumentation" poster presentation by M. Huarte-Espinosa, A. Cogliati, T. Li, and J. P. Rolland, at CEIS University Technology Showcase, Doubletree Hotel, 3/26/13

Progress/Planned

TASKS	DESCRIPTION	2013 1st Quarter			2013 2nd Quarter		
		Jan	Feb	Mar	Apr	May	Jun
P1.1.1	Eikonal+ mapping						
	Develop entity relationship maps using Understand	5.0%	10.0%	20.0%	30.0%	40.0%	50.0%
P1.1.2	Graphics interface						
a	Library identification & installation	5.0%	20.0%	100.0%			
b	Library testing in communication with code	0.0%	0.0%	0.0%	5.0%	20.0%	35.0%
P1.1.3	Code security design	0.0%	0.0%	0.0%	2.0%	20.0%	30.0%

DONE
PLANNED

Rochester Regional Optics,
Photonics & Imaging Accelerator (RRPA)

University of Rochester
DOE # DE-EE0006033

Project 2: Reclamation of Slurries used in Optical Manufacturing Operations

Status Report
April 24, 2013

Stephen D. Jacobs
Senior Scientist, LLE
and
Mark M. Mayton
President, Flint Creek Resources
Gorham, NY

FCR

Project Description

- We will refine and expand current industrial activities to reclaim and recycle polishing slurries used to manufacture optical components
  - Flint Creek Resources (FCR-Gorham, NY) has a process that is successful for reclamation of ceria-based slurries
  - An existing collaboration between FCR and Sydor Optics in Rochester to improve efficiency of their ceria recycling effort will be expanded
  - The commercial impact (cost and quality) on products manufactured by Sydor Optics will be assessed
  - A second collaboration with an Upstate NY company will be initiated
  - Chemistries for reclamation of more complex, spent slurries will be developed

FCR

Progress for 1st quarter: January-March 2013 - U of R

U of R Student/Staff Activities

- Tess Jacobs- The Institute of Optics, sophomore
  - Water quality assessments at Sydor and FCR-done
  - Slurry analyses: particle size and charge (ζ-potential)-begun
  - Loss on ignition tests for spent material analysis-begun
- Debra Saulnier-LLE Horton Fellow, Ch. E. Department, PhD candidate
  - SEM analyses of slurries/spent materials –begun
- Brittany Taylor-LLE laboratory engineer
  - XPS or other analyses of slurries/spent materials -begun

FCR

Sydor Optics Double Sided Polisher

Commercial cerium oxide polishing abrasives

Progress for 1st quarter: January-March 2013 - FCR

Flint Creek Resources Activities

- Sample preparation for U of R – done
- EDS composition analysis of solids at each stage of process – done
- Separation throughput improvement tests – done
- Waste water throughput improvement tests – done
- Modification of virgin slurry suspension to improve collection efficiency – in progress

FCR

Progress for 1st quarter: January-March 2013 (cont.)

Publications and Presentations

- "Reclamation of Slurries Used in Optics Manufacturing," poster presentation by T. Jacobs for M. Mayton, Z. Hobbs and S. D. Jacobs, at CEIS University Technology Showcase, Doubletree Hotel, 3/26/13

Work for next quarter

- Partial completion of physical properties analyses for Sydor slurries and spent materials
- Preparation and presentation of a poster paper at the U of R MRS Symposium on Materials Research, 20 May 2013 (T. Jacobs)
- Preparation of an semi-annual interim report for July 2013
- Continue separation throughput improvement tests
- Complete virgin slurry suspension work
- Develop process to handle oversize agglomerates

FCR

ETA

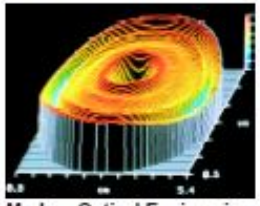
52nd Annual

Summer Course Series 2013

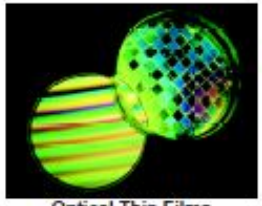
The Institute of OPTICS University of Rochester

June 3 - 14, 2013

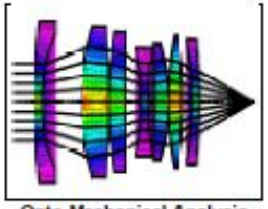
Fundamentals of Optics
June 3-5 (2½ Days)



Modern Optical Engineering
June 5 - 7 (2½ Days)

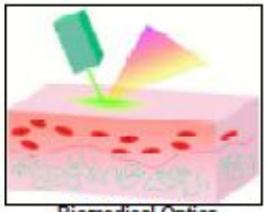


Optical Thin Films
June 3 - 7 (5 Days)



Opto-Mechanical Analysis
June 5 - 7 (2½ Days)

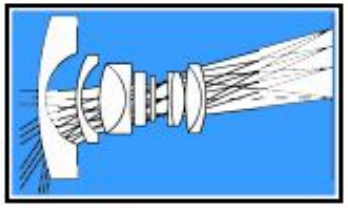
Lasers and Optoelectronics
June 10 - 12 (2½ Days)



Biomedical Optics
June 12 - 14 (2½ Days)

Optical System Design

Two Overlapping Courses - 5 Days
Part I, Introduction - June 10-12 (3 Days)
Part II, Advanced Topics - June 12-14 (3 Days)



The Institute of Optics' renowned expertise in optical science and engineering offers a unique environment for engineers, scientists, technicians, and students to learn about the fundamentals of optics and the advancing state of the art.

For additional information, please contact our website:

www.optics.rochester.edu/summerschool

The Imaging Chain

1. What energy is used to create the image? *Radiometry*
2. How does the energy interact with matter? *Color Science*
3. How is the energy collected after the interaction? *Geometric optics*
4. How is the collected energy captured? *Sensors*
5. How is the collected signal manipulated? *Image Processing*
6. How is the information displayed? *Image Display and Evaluation*
7. How is the information perceived? *Human Vision*

Optoelectronics Principles & Devices

Instructor: Drew N. Maywar, RIT
Partner Course: OE Device Packaging Processes

- Basic concepts, principles of operation, datasheets & quantities, diagnostics, laser safety
- Background in optoelectronics is not required

Lecture in AM

Day 1	Day 2	Day 3
Optical Signals	LEDs	Q-factor
Intro LDs, LEDs, PDs	LDs	Eye Diagram
Intro Optical fiber & connectors	Optical Modulation	Noise
Laser Safety	PDs	Jitter
Safety Exam	Tx & Rx	Attenuation
	Optical Fiber	Dispersion

Hands-on Lab in PM

Students will perform 2 stations of their choice each afternoon

- LED & LD Optical Spectrum
- Fiber Fusion Splicing
- Rise Time & Dispersion
- Eye Diagram
- LD & LED L-I Curve
- Fiber Inspection & Cleaning
- Fiber Attenuation

- Ideal max enrollment: 14 (lab space)

RRPA: Summer Shortcourse at RIT in Microelectronic Engineering facility

- **Hoped to model this on one week IC Processing Shortcourse**
  - Lecture and lab combination; design on Monday, fab Tu-Th, test on Fri
- **Spring 2013: Met with local Optics industry for input**
  - StamperTech, JML, RPO, Optimax, STC
  - Confusion over IC Processing Curriculum … took it as the Optics Course curriculum as opposed to a template and suggestive content
  - We have input now on the topics of interest (at least to the folks we visited)
  - We have more than one company preferring 1-2 day courses vs. whole week
- **Status**
  - Dynamax (imager chips) is coming to STC (and STC itself) appear to prefer the IC Processing course with minor modification to reflect MEMs or Imager interest (key is Microlithography piece)
    - Consider applying tuition to this course for these clients?
  - Optical Thin Film Course may come into existence as 2-3 day offering focused on thin film coating technology and metrology
    - Cut tuition fee and have more seats?

ETA: University of Rochester Institute of Optics Summer School

Total scholarships awarded: 21

Optical Thin Film Coating - *4 scholarships*

covers all aspects of optical interference devices including thin-film design, digital design methods, and coating and characterization.

Fundamentals of Optics- *4 scholarships*

covers lenses, aberrations, principles of diffraction, optical systems, polarization, birefringence and crystal optics, and radiometry and detection.

Modern Optical Engineering - *4 scholarships*

covers optical testing and instrumentation, optical manufacturing, optical thin film coatings, diffractive optics, and glass in modern optics.

Opts-Mechanical Analysis - *1 scholarship*

covers opto-mechanical analysis methods used to design high performance

Lasers and Optoelectronics - *2 scholarships*

covers basics of lasers, laser systems and modern laser engineering, nonlinear optics, and semiconductor lasers LED's, and detectors.

Biomedical Optics - *0 scholarships*

covers diffusion models of photon propagation in multiply-scattering tissues applications of photon migration: tumor detection and brain monitoring spectroscopic methods for glucose sensing and other analyte detection tissue alteration: photodynamic therapy and LASIK high-resolution imaging: confocal microscopy, multiphoton microscopy, and optical coherence tomography.

Optical System Design - *6 scholarships*

introduces participants to both fundamental and advanced concepts in optical system design by integrating classroom lectures with software training labs in the Hopkins Optical Design Center.

ETA: Rochester Institute of Technology

Total scholarships awarded: 1

Foundations of Imaging Science *- 1 scholarship*

Dr. Susan Farnand

The objective of this 2-week intensive course is to provide a comprehensive overview of the entire imaging process – from the physics of light to the perception and analysis of images. Students will attend lectures that introduce them to a range of topics covering the imaging chain including radiometry, color science, geometric optics, sensors, image processing, image display, the human visual system, and image evaluation.

Optoelectronics Devices, Packaging and Assembly *- 0 scholarships*

Dr. Drew Maywar, Dr. Alan Raisanen, and Dr. S. Manian Ramkumar

This course teaches the basic principles of optoelectronic devices, while providing extensive hands-on experience using such devices to transmit, receive, and analyze optical signals in the laboratory. Devices include lasers diodes, light-emitting diodes, optical fiber, and photodiodes.

Optical Thin Film Processing *- 0 scholarships*

Dr. Michael Jackson

The objective of the course is to provide a comprehensive, hands-on educational experience in the processing of thin films for use in optics and photonics. Students will attend a combination of lectures and labs to gain a working knowledge of deposition, etch, patterning, and metrology in relation to optical thin films.

SBA

HIGH TECH ROCHESTER
innovate. incubate. grow.

- Outreach activities for targeted companies and 7(j) eligible entrepreneurs planned for April 30 and June 20, 2013
- Assembled and updated target company contact database
- Designed SBIR/STTR workshop to be delivered on April 30 in conjunction with the local SBDC and PTAC centers as well as the University of Rochester and the NYSTAR-designated Regional Specialist for SBIR/STTR funding
  - Introduction to SBIR/STTRs
  - Proposal writing workshop
  - S.A.M. registration for attendees

    (System for Award Management)

HIGH TECH ROCHESTER
innovate. incubate. grow.

- Initiated contract with consultant for PTAC and government subcontracting registration and support for target companies
- Initiated outreach for connections between target companies and other regional entrepreneurial training opportunities including The Entrepreneurs Network
- Reviewed current7(j) eligibility criteria for the Rochester metropolitan area and surrounding counties in our region

Reporting

ADVANCED MANUFACTURING JOBS AND INNOVATION ACCELERATOR CHALLENGE
REPORTING MATRIX

Agency	Report	Due dates	Submission
EDA/NIST/DOE/ETA/SBA	Updated Integrated Work Plan (IWP)	Quarterly: Jan. 31, April 30, July 31, Oct. 31	mfgjobsaccelerator@eda.gov *ETA Grantees will also submit via the Electronic Grantee Reporting System - HUB (see below for details)*
EDA/NIST/DOE/ETA/SBA	Collaboration Events for All Grantees	Every Other Month	Conference Call
EDA/NIST/DOE/ETA/SBA	Multi-Agency Grantee Progress Calls	As Needed	Conference Call
EDA	Federal Financial Report (SF-425)	Semi-Annually: April 30, Oct. 31	EDA Regional Office Project Manager
EDA	Request for Reimbursement (SF-270)	As needed (max. once/month)	EDA Regional Office Project Manager
EDA	Project Progress Report	Semi-Annually: April 30, Oct. 31	EDA Regional Office Project Manager
NIST	Federal Financial Report (SF-425)	Quarterly: Jan. 31, April 30, July 31, Oct. 31	NIST MEP system
NIST	Progress Report	Quarterly: Jan. 31, April 30, July 31, Oct. 31	NIST MEP system
DOE	Progress Report	Quarterly: Apr. 30, July 31, Oct. 31, Jan. 31	Energy Efficiency and Renewable Energy (EERE) Project Management Center (PMC)
DOE	Federal Financial Report (SF425)	Quarterly: Apr. 30, July 31, Oct. 31, Jan. 31	EERE-PMC
DOE	Final Technical Report (FTR)	At the end of the project. (Note: Recipients must refer to and abide by the official award Reporting Requirements Checklist that will be sent to them.)	EERE-PMC
DOE	Request for Reimbursement (SF-270)	As needed (max. once/month)	Vendor Invoice Approval System
ETA	Participant Outcomes; IWP/Narrative Reports	Quarterly: Feb 14; May 15; Aug 14; Nov 14	Electronic Grantee Reporting System - HUB
ETA	Financial Status Report (ETA-9130)	Quarterly: Feb 14; May 15; Aug 14; Nov 14	Electronic Grantee Reporting System
SBA	Progress Report with SF PPR	Quarterly: Jan. 31, April 30, July 31, Oct. 31	SBA Headquarters Grants Officer Representative
SBA	Federal Financial Report (SF-425)	Quarterly: Jan. 31, April 30, July 31, Oct. 31	SBA Headquarters Grants Officer Representative
SBA	Request for Reimbursement (SF-270)	Quarterly: Jan. 31, April 30, July 31, Oct. 31	SBA Headquarters Grants Officer Representative