A major milestone in COM’s DARPA-sponsored Conformal Deterministic Microgrinder (CDMG) development program has been completed: the design of the newest addition to the Opticam family of machines has been finalized by Moore Nanotechnology Systems (Keene, NH). Nanotechnology Systems, an affiliate of Moore Tool Company in Bridgeport, CT, is responsible for CDMG machine design, assembly, installation, qualification, and on-going commercialization. As is the case in all COM programs, a COM Manufacturing Advisory Board meets regularly to guide and counsel CDMG development.

The new microgrinder, named the Nanotech™ 500FG by Nanotechnology Systems, will provide the optics industry with next-generation conformal optics manufacturing capability. The computer numerically controlled, multi-axis, ultra-precision machining system is capable of generating arbitrary conformal optical surface (including non-spherical and non-axisymmetric) shapes within a 250 mm x 250 mm x 300 mm machining envelope. The Nanotech™ 500FG will be the flagship of Nanotechnology Systems’ ultra-precision machining systems.

As an added benefit (should the remote possibility arise), the grinding head can be swapped out for a single point diamond turning post that can be mounted in its place. In addition to its multi-axis grinding and
diamond turning capability, the machining system has the ability to true freeform raster grind far off-axis segments, thus negating the need to attempt unrealistically large swings. The Nanotech™ 500FG incorporates a host of novel design features and has unprecedented optics manufacturing versatility. These machine design features, combined with advanced control and feedback systems, will produce optical surfaces that typically require little or no post-polishing.

The development of a cost effective machining system that produces freeform optical shapes will add a significant dimension to the industry’s manufacturing capability. DARPA, working with the DoD prime contractors (Raytheon and Boeing) involved in this program, has already identified several candidate military systems that stand to benefit from this enabling technology. Conformal optical shapes include both axisymmetric and non-axisymmetric optical components and may have a combination of aspherical, spherical, cylindrical, conical, diffractive, plano, or ogive shapes, in materials ranging from optical glass and infrared materials, to non-ferrous metals, crystals, polymers and ceramics.

While COM has spearheaded the Nanotech™ 500FG development initiative, the real credit for the success of the program belongs to the CDMG Manufacturing Advisory Board (Eastman Kodak, Lockheed Martin, Raytheon TI Systems, II-VI) and Moore Nanotechnology Systems for their invaluable technical support, and to DARPA for the funding support that is making the program possible.

The 500FG will be commissioned at COM in January, 1999. For information on the conformal optics program, or other COM activities, please contact Jeff Ruckman or Harvey Pollicove at 716-275-1093. For information on the Nanotech™ 500FG, contact Moore Nanotechnology Systems at 603-352-3030.

Nanotech™ 500FG Specification Overview

| System Configuration | Standard: Three linear axes (X, Z & Y); and workpiece spindle Options: Rotary axis (B); grinding attachment |
| Workpiece Capacity   | Axisymmetrical: 20” diameter x 10” long (500mm x 250mm)  
Non-Axisymmetrical: 10” x 10” x 6” (250mm x 250mm x 150mm)  
Maximum Weight: 120lbs (55kg) @ spindle nose |
| Base Structure       | Monolithic natural granite with integral Z axis risers. |
| Control System       | Fanuc 15MB with high speed serial buss, PC operator interface, and color touch screen display. 0.4µ” (10nm) programming resolution. |
| Work Spindle         | Air bearing, with integral direct drive DC servo motor. 100-2000rpm speed range. Less than 2µ” (50nm) radial & axial runout. |
| Linear Axes & Feedback | Fully constrained, oil hydrostatic, asymmetric box way slides. Travels: X & Z – 12” (300mm), Y – 8” (200mm). Driven by DC servo motor and precision ball screw with flexure coupling. 0.4µ” (10nm) resolution feedback athermally mounted laser holographic linear scales. |
| Other Options        | In-situ LVDT tool/wheel probing with automated setting routines, also In-situ LVDT part probing, with form error analysis and compensation for the correction of repeatable systematic errors. |
| Warranty             | One year full parts & labor warranty, in addition to a 10 year extended warranty on the geometric accuracy of all linear axes. |
Help COM Support Optics Manufacturing Education by Donating a Single Spindle Machine!

Optics 443: *Optical Fabrication and Testing* at the University of Rochester, the only course of its kind in the U.S., is offered as a technical elective through The Institute of Optics to undergraduate seniors and graduate students in optics, mechanical engineering, and materials science. Optics 443 gives students a first-hand working knowledge of optical glasses, their properties, and the methods for specifying, manufacturing, and testing high quality optical components. Since 1986, when it was substantially revised by Dr. S. D. Jacobs, over 120 students have completed the lecture and laboratory sessions.

Lectures emphasize the optical and physical properties of glass, and how these influence the grinding and polishing process. Conventional fixed/loose abrasive grinding and pitch polishing are examined. New methods for optical polishing process. Conventional fixed/loose abrasive grinding and pitch polishing are examined. New methods for optical fabrication technology and a BS in mechanical or optical engineering, physics or materials engineering.

The laboratory portion of the course exposes the student to abrasive grits, slurries, pitch polishing and the various nature of the conventional fabrication process, under the guidance of a master optician. Glass types and part shapes are assigned to illustrate the degree of difficulty required to achieve optical quality surfaces with hand and machine operations.

In-process metrology is performed with a variety of instruments, including a Horiba particle size analyzer, PocketSurf® III stylus profilometer, Zygo New View® white light interferometer microscope, Zygo laser interferometer, Davidson interferometer, spherometer, Nikon autocollimator and Fizeau interferometers. A glass melting project allows students to mix, melt, cast and anneal an ionically colored glass cube.

COM provides significant financial support for Optics 443. Most of the revenue from the COM Summer School is donated to support the teaching of the lab sections by a master optician. Two years ago, one of 5 single spindle polishers was lost due to "old age." The lack of a fifth polisher has meant tightening up selection criteria for students wishing to enroll in the course.

To accommodate all who want to take Optics 443, we are requesting the donation of a single spindle machine to the Center. Please contact Michele Richard at COM if you might be able to help (phone 716-275-2753, fax 716-275-7225, email: MRIC-COM@LLE.ROCHESTER.EDU).

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**Job Postings**

**COMPANY:** Crystal Systems
27 Congress Street
Salem, MA 01970
Attn: Maynard B. Smith
Fax: 978-744-5059
Email: maynard@crys.com

**Title:** Project Engineer
**Description:** Contract and internal research related to sapphire and silicon fabrication processes. Areas of responsibility include studying mechanical properties and advancing slicing and grinding techniques in related activities. Involves both hands-on and analytical skills, along with a strong background in communication.

**Experience:** Fabrication technology and a BS in mechanical or optical engineering, physics or materials engineering.

Please send resume to address above.

**COMPANY:** Evaporated Metal Films Corp.
239 Cherry Street
Ithaca, NY 14850
Attn: Jennifer Tegan
Fax: 607-272-3369
Email: jrtegan@lightlink.com

**Title:** Optical Fabrication Manager
**Description:** Responsibilities include: management of fabrication department of 8+ employees and plano fabrication equipment including: CNC mills/cutting tables, continuous lap pitch and poly polishers, blanchards and spindle polishers; planning/direction for department; training/supervision of employees; development of fabrication capabilities for company. Important skills: familiarity with World Class Manufacturing methodology; excellent formal problem-solving; formal training in safety/quality programs; proficient with spreadsheet, database, presentation and project management software.

**Experience:** BS/BA in optical engineering and four years experience, or equivalent combination of education/experience. Four to eight years experience with management/supervision/departmental development in optical fabrication environment or eight years related experience.

Please mail or fax application package, including salary history or specific salary requirements.

**COMPANY:** Heraeus Amersil, Inc.
3473 Satellite Blvd.
Duluth, GA 30136-5821
Attn: Human Resources
Fax: 770-623-0116

**Title:** Inside Sales Support
**Description:** Responsibilities include: selling/product application support; order entry/maintenance; quote preparation/follow-up; general administrative duties. The ideal candidate will have excellent written and verbal communication skills and be able to work with very little supervision in a fast-paced customer service department. Competitive pay and excellent benefits are provided.

**Experience:** BS/BA in one of the following disciplines: computers, business, communications, service or technical. Skilled in MS Word, Excel, graphics (Mac/DOS); SAP experience a plus.

Please mail or fax application package, including salary history or specific salary requirements.

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APOMA ANNOUNCES NEW WEBSITE!
www.apomanet.org

The American Precision Optics Manufacturers Association (APOMA) has launched its official organization website at: www.apomanet.org. The new site, which will contain APOMA information, new-member applications, member bulletin boards, general news and links to industry-related sites, will be managed in Rochester, NY by Robert Novak of Monroe Community College, Secretary of APOMA. Questions or comments regarding the new site, and suggestions for using this new resource, may be directed to Robert Novak (phone/fax 716-346-9513, email: movak@apomanet.org).

Welcome
New APOMA Members!

Mindrum Precision
10000 4th Street
Rancho Cucamonga, CA 91730
Rep: Dennis Winegarner
Phone: 909-989-1728
Fax: 909-987-3709

New Machines, Tools and Processes for Modern Optics Manufacturing (with Labs)

COM’s annual summer school, “New Machines, Tools and Processes for Modern Optics Manufacturing,” will be offered from June 22-25, 1998 in Rochester, New York. The course is organized into 17 talks and tutorials providing an overview of emerging technologies that will shape the way optics are manufactured into the next century.

Guest speakers join COM/University of Rochester professors and engineers to present the most recent manufacturing technology advances in deterministic processing and flexible automation for producing spherical, aspheric, and conformal optics. The program is very interactive, providing two full afternoons of laboratory work on computer integrated manufacturing of aspheres, programming a CNC machine for complex shapes, noncontact probes, magnetorheological finishing, and modern optics metrology.

The cost for the 4 day course is $1,000; more information may be obtained by contacting Gayle Thompson at The Institute of Optics (phone 716-275-0056, fax 716-244-4936, email: GAYLE@OPTICS.ROCHESTER.EDU).

We welcome your submissions!
Fax or e-mail your news and job postings to Michele Richard at COM,
(fax 716-275-7225,
e-mail: MRIC_COM@LLE.ROCHESTER.EDU).

Stop by and visit COM on the web!
www.opticam.rochester.edu

CONVERGENCE • May/June 1998
Job Postings

COMPANY: Melles Griot Optical Systems
55 Science Parkway
Rochester, NY 14620
Attn: D. Gsellmeier
Fax: 716-244-6292

Title: Optical Fabricators, First/Second Shift
Description: Experienced individuals to work from blueprints on prototype designs to achieve $\lambda/10$ regularity and hold radius to 1 fringe variance and center thickness to +/- .05mm or less. Responsible for planning/executiong operations before polishing, selecting blocking tools, utilizing phase measuring interferometers.

Title: Optics Test Technician
Description: Requires component and system testing of complex, multi-element optical systems. Both prototype characterization for design qualification and high volume testing are involved. Must have the ability to communicate technically with customers, including report writing/documentation.
Experience: Four years experience, optics/related field degree required.

Please send resume to address above.

COMPANY: Ocular Instruments, Inc.
2255 116th Avenue, N.E.
Bellevue, WA 98004
Attn: Jim Redlinger
Fax: 425-462-6669

Title: Optician/Polisher
Description: Experienced optician for manufacturing precision lenses. Responsible for grinding, polishing and assembling optics. Supervision experience a plus.
Experience: AAS degree in optics or 2-3 years related experience.

Please send resume to address above.

COMPANY: Speedring Systems, Inc.
2909 Waterview Drive
Rochester Hills, MI 48309
Attn: Barbara Mobey or Dale Sabo
Email: Dales@speedringsys.com
Barbm@speedringsys.com
Fax: 248-853-2540

Title: Product Manager, Optical Products
Description: Responsibilities include managing all optics accounts from scheduling, status monitoring, cost and customer interface perspective; orders, sales projections for short/long term forecast; establish objectives for sales engineers; ensure all technical and contractual issues with mil/aero customers are resolved.
Experience: BS degree; experience selling optical components/instruments to the mil/aero industry; knowledge of optics market (applications/end users/competitors) and commercial/government procurement procedures; PC operations including spreadsheets, project planning.

Please send resume to address above.

COMPANY: Sverdrup Technology, Inc.
620 Discovery Drive
Huntsville, AL 35806
Attn: Human Resources
Fax: 205-971-9475

Title: Diamond Turning Machinist
Description: Setup, operation, and upkeep of diamond turning machines for fabrication of metallic and non-metallic optical components.
Experience: Minimum 3 years hands-on experience manufacturing optical elements on a diamond turning machine; experience fabricating flat/spherical/aspheric surfaces and diamond turning Fresnel lenses and cylindrical mirror mandrels.

Please send resume to address above.

COMPANY: U.S. Precision Lens, Inc.
4000 McMann Road
Cincinnati, OH 45245
Attn: Michael Reinert
Email: ReinertMF@corning.com
Fax: 513-943-5633

Title: Process Engineer - Glass Optics
Description: USPL seeks individual to plan, develop, and implement manufacturing process, equipment and tooling improvements in its Glass Optics Fabrication Department, principally in a high-volume, fully automated CNC facility.
Experience: Two year technical degree and glass manufacturing experience are required. The successful candidate will demonstrate strong communication, organizational, and problem-solving skills, and high initiative in a team-based environment. A working knowledge of basic statistics is helpful.

Please send resume to address above.

COMPANY: VLOC, Subsidiary of II-VI
6736 Commerce Blvd.
Port Richey, FL 34668
Attn: Fran Hay
Email: Fran@VLOC.com
Fax: 813-848-2913

Title: Laser Test and Quality Engineer
Description: Engineer to design/create/operate laser test beds. Active laser testing plus additional opto-electronic testing, including autocollimator, interferometer, centration, retardance, etc. Responsibilities include: document laser test setups including operation, calibration, maintenance, troubleshooting; assist in investigating production/quality problems, implementing production improvements; perform material characterization/allocation; document quality statistics/customer contact.
Experience: BS in Physics, EE, Optics, or related field; 2 years production/lab experience (will consider school lab experience); familiarity with laser optical and electronic instrumentation.

Send letter, resume and salary requirements.
1998 Industry Events

Representatives from COM will be attending the following optics industry events. Stop and see us at:

OSA OF&T ‘98, Kailua-Kona, HI
June 8-12, 1998

COM Summer School, Rochester, NY
June 22-25, 1998

SPIE Annual Meeting, San Diego, CA
July 19-24, 1998

OSA Annual Meeting, Baltimore, MD
October 4-9, 1998

Newsletter Mailing List Update

Please let us know of any address corrections, additions, or deletions by completing this form. Mail or fax to Michele Richard at the Center, fax 716-275-7225.

Name: ____________________________________
Title: _____________________________________
Company: _________________________________
Address: __________________________________
City, State, Zip: _____________________________
Phone: ________________ Fax: ________________
E-Mail: ____________________________________

Center for Optics Manufacturing
University of Rochester
240 East River Road
Rochester, NY 14623-1212