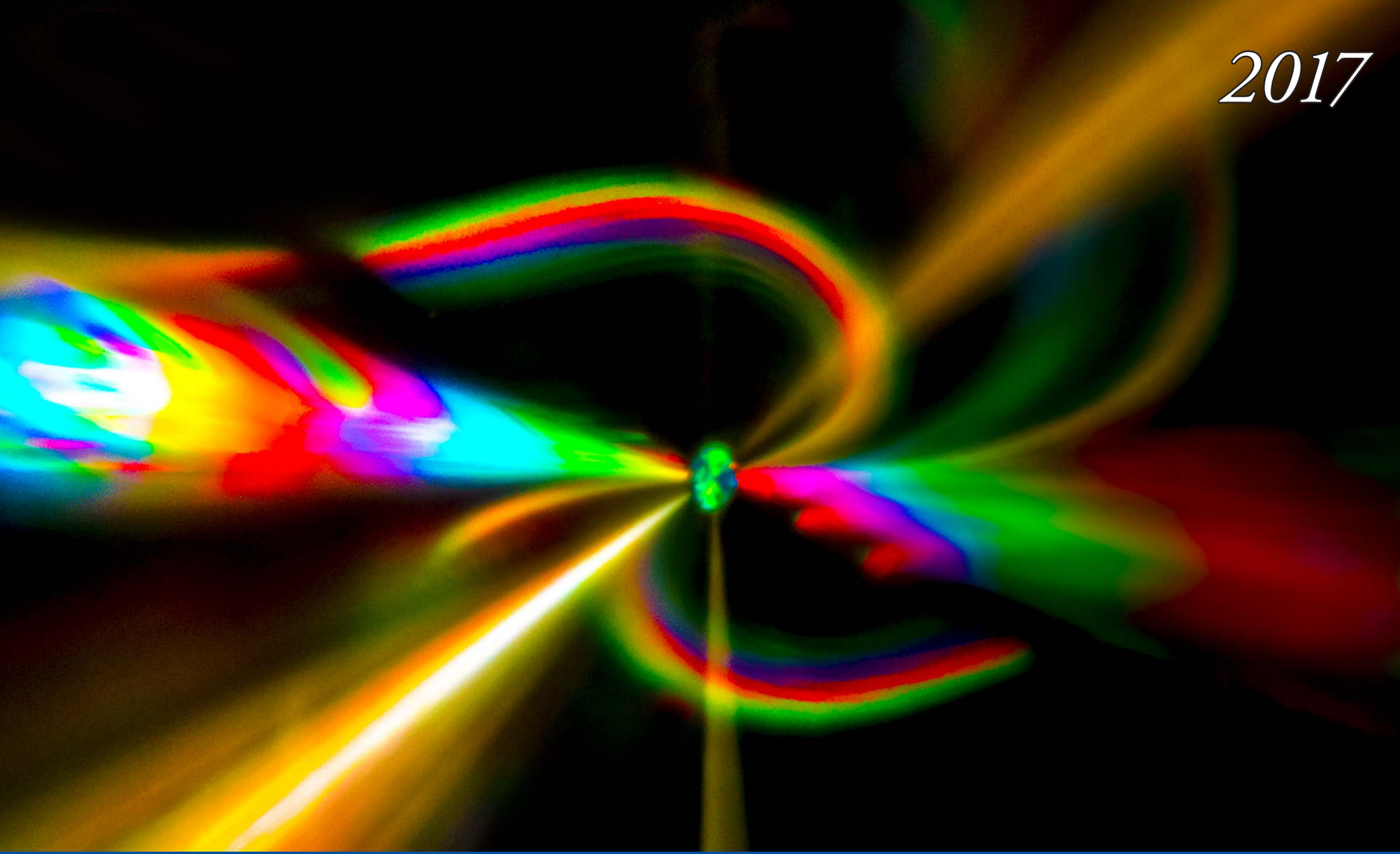

2017

LABORATORY *for* LASER ENERGETICS

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UR LLE

Mission Statement

The Laboratory for Laser Energetics (LLE) of the University of Rochester is a unique national resource for research and education in science and technology. The Rochester area has a history of innovation, providing a unique setting for LLE within a technologically sophisticated community. Established in 1970 as a center for the investigation of the interaction of intense radiation with matter, the Laboratory has a five-fold mission:

1. to conduct implosion experiments and basic physics experiments in support of the National Inertial Confinement Fusion (ICF) Program;
2. to develop new laser and materials technologies;
3. to provide graduate and undergraduate education in electro-optics, high-power lasers, high-energy-density physics, plasma physics, and nuclear fusion technology;
4. to operate the National Laser Users' Facility (NLUF); and
5. to conduct research and development in advanced technology related to high-energy-density phenomena.

The 2017 LLE Calendar contains information about many of the Laboratory's programs. We hope that you enjoy using your copy of the LLE Calendar and wish you a productive and fulfilling 2017.

LLE is funded by the National Nuclear Security Administration (NNSA) to support its Stockpile Stewardship Missions.

Photography by Eugene Kowaluk

National Nuclear Security Administration

Welcome to 2017

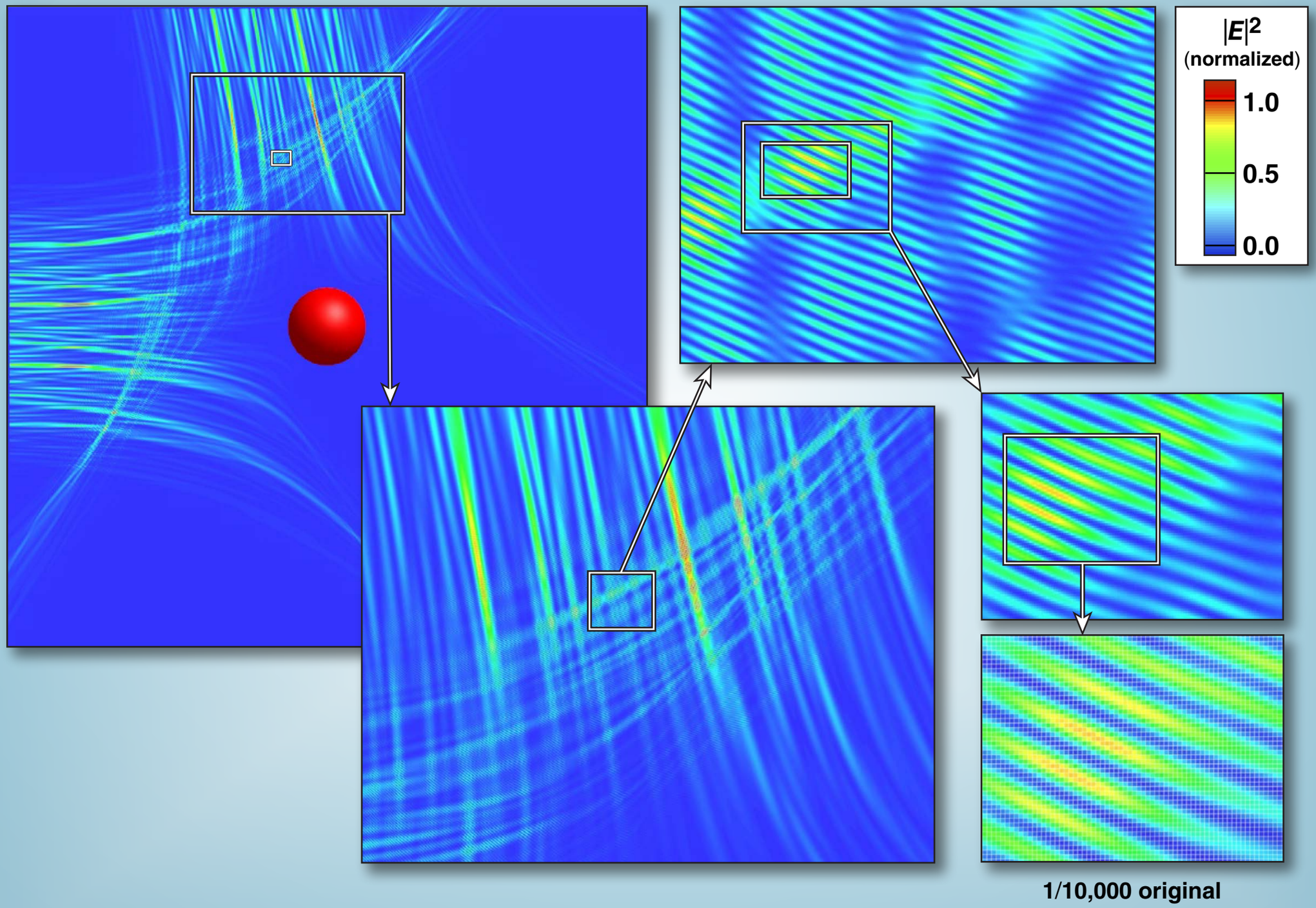
LLE Vision

LLE envisions a secure, environmentally neutral, and inexhaustible energy source for mankind. This future energy source—fusion—is the basis of the sun's energy and is carbon and radioactive-waste free.

2017 will be a year of challenges and opportunities

- Ongoing pursuit of ignition and the development of ignition alternatives
- Polar-direct-drive implosions at the National Ignition Facility
- Omega will remain the premier high-energy-density user facility
- Education and training of students (high school through Ph.D.) is a high priority

Prof. Robert L. McCrory
University Professor
Vice President, Vice Provost, University of Rochester
Director, Laboratory for Laser Energetics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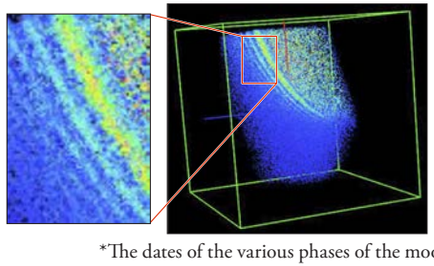
1/10,000 original

Laser-Plasma Simulation

The *LPSE* code system was developed to study laser–plasma interaction physics problems. The figure above is from a 2-D *LPSE* calculation highlighting the range of scales involved in cross-beam energy transfer. Two speckled laser beams enter from the left and upper boundaries, propagating inward. The speckles diminish in intensity (see color code) over several tens of microns as a result of absorption and beam bending caused by refraction. The red dot shows the location of the critical-density region.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 New Year's Day	2 University Holiday	3	4	5 ◐*	6	7
8	9	10	11	12 ○	13	14
15	16 Birthday of Martin Luther King, Jr.	17	18	19 ◑	20	21
22	23	24	25	26	27	28 ●
29	30	31				



DECEMBER 2016

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FEBRUARY

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*The dates of the various phases of the moon and the equinox and solstice dates are from the U.S. Naval Observatory data tables and are based on Universal Time (UT); see: http://aa.usno.navy.mil/data/docs/MoonPhase.php and http://aa.usno.navy.mil/data/docs/EarthSeasons.php, respectively.

JANUARY 2017

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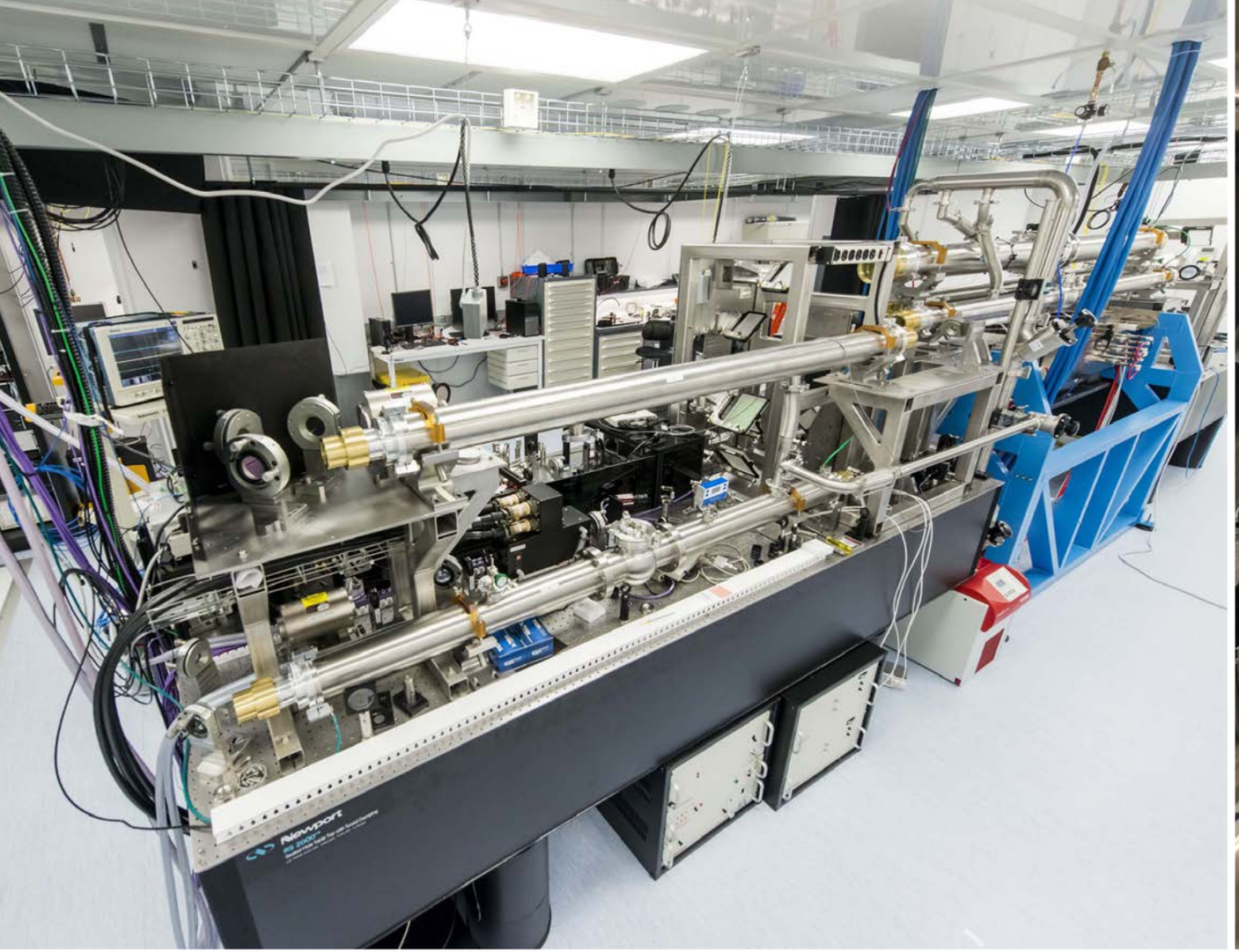
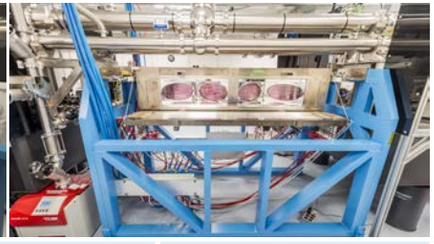

Newport

Dynamic Compression Sector Laser

Funded by Washington State University, LLE constructed the Dynamic Compression Sector (DCS) laser, which is now installed at the Advanced Photon Source in Argonne National Laboratory. The DCS laser is a 100-J tool for shock-physics experiments to be carried out at a first-of-a-kind user facility dedicated to dynamic compression science.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2	3	4 ◐
5	6	7	8	9	10	11 ○
12	13	14	15	16	17	18 ◑
19	20 Washington's Birthday	21	22	23	24	25
26 ●	27	28				

JANUARY

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29	30	31				

MARCH

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FEBRUARY 2017

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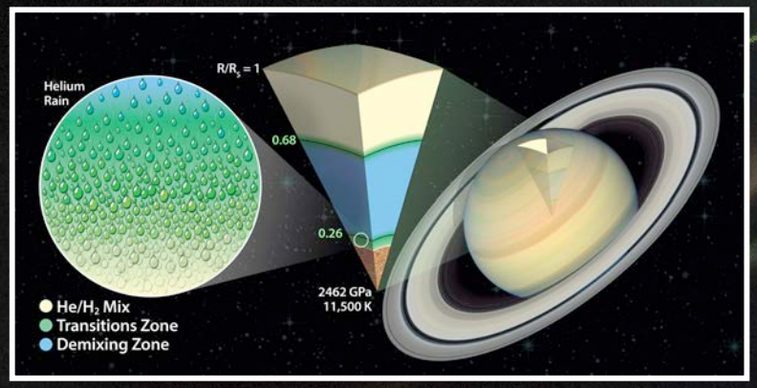

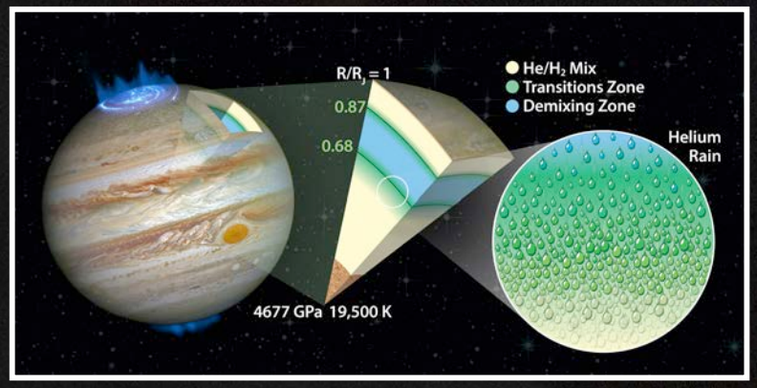

Renderings by Clayton L. Dahlen

Helium "Rain" on Saturn

Experiments conducted by a collaborative team from the University of California–Berkeley, LLNL, LLE, and CEA provide evidence that H and He demixes at the high pressures expected to exist deep inside Saturn and Jupiter. The demixing may create a type of "He rain" that may explain the planets' higher-than-expected luminosity. Two of the co-authors are Marius Millot (LLNL) and Stephanie Brygoo (CEA).

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
FEBRUARY S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28			1	2	3	4
5 ◐	6	7	8	9	10	11
12 Daylight Savings Time Begins ○	13	14	15	16	17	18
19	20 Spring Equinox ◑	21	22	23	24	25
26	27	28 ●	29	30	31	**APRIL** S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MARCH 2017

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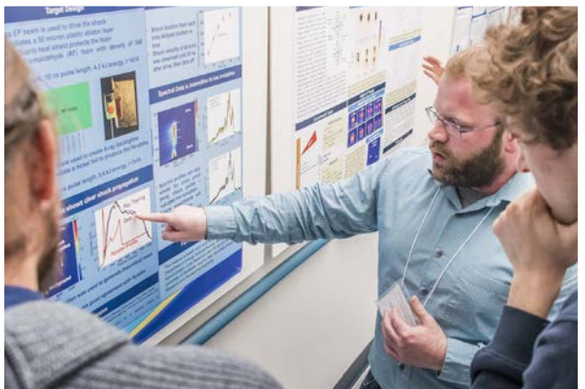

Omega Laser Facility Users Group (OLUG)

The Eighth Omega Laser Facility Users Group Workshop, held 27–29 April 2016, attracted 112 researchers from around the world. Most of the 76 contributed posters were given by students and postdocs in attendance. The next workshop will be held 26–28 April 2017.

MARCH

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MAY

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SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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16	17	18	19 ◑	20	21	22
23	24	25	26	27	28	29
30						

← Omega Laser Facility Users Group Workshop at LLE →

●

APRIL 2017

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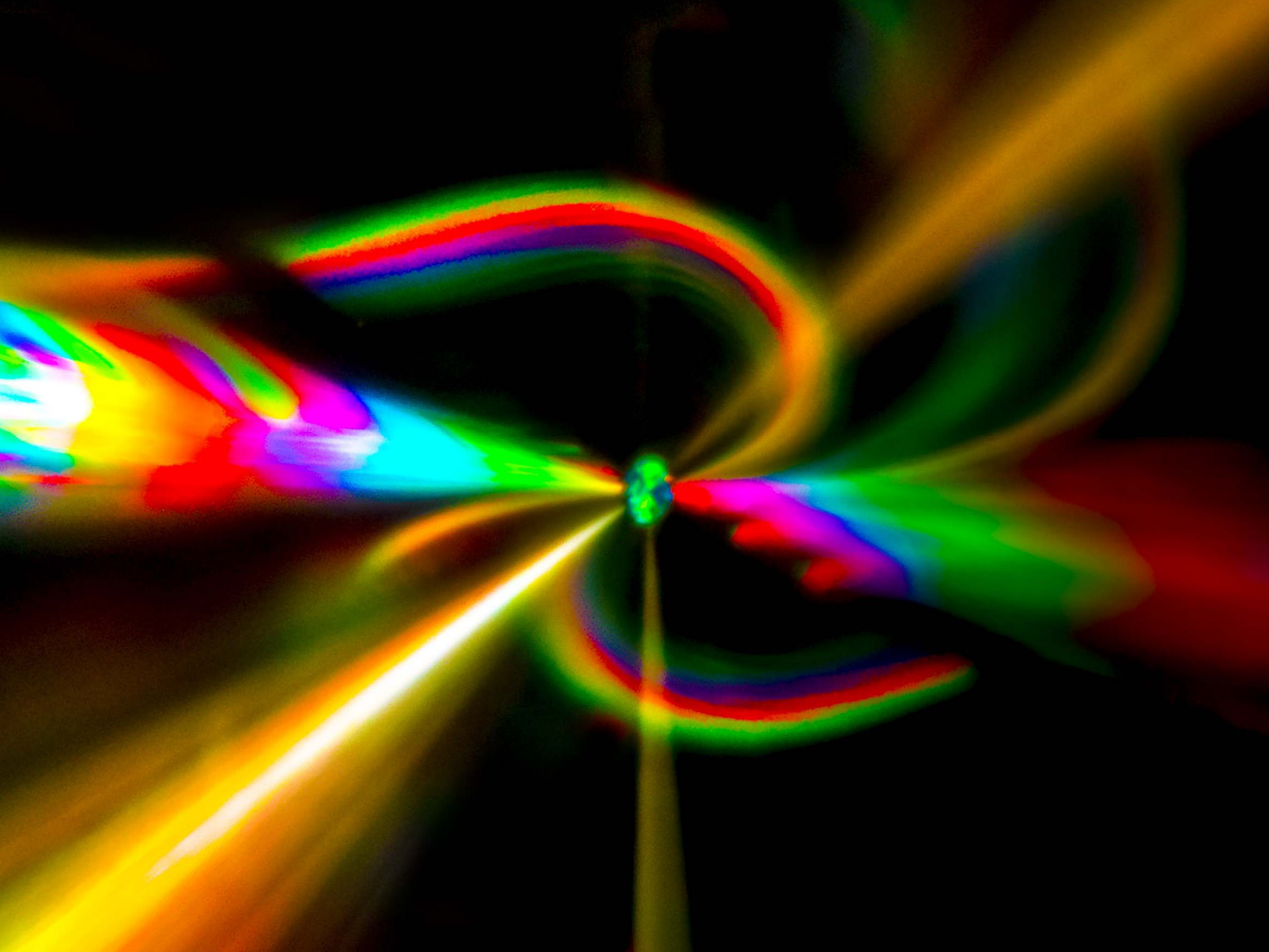
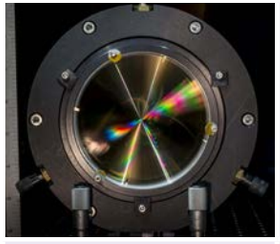


The Graxicon

Brilliant colors illustrate the complex interaction between the diffractive and refractive axicons that constitute a Graxicon, an optic developed by the Optics and Imaging Sciences group. The Graxicon can be designed to provide rapid focal-spot zooming to increase laser coupling to fusion targets or to provide a rapidly changing ring beam for a variety of laser applications.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1	2	3 ◐	4	5	6
7	8	9	10 ○	11	12	13
14	15	16	17	18	19 ◑	20
21	22	23	24	25 ●	26	27
28	29 Memorial Day University Holiday	30	31			

MAY 2017

APRIL

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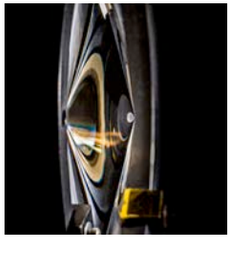

JUNE

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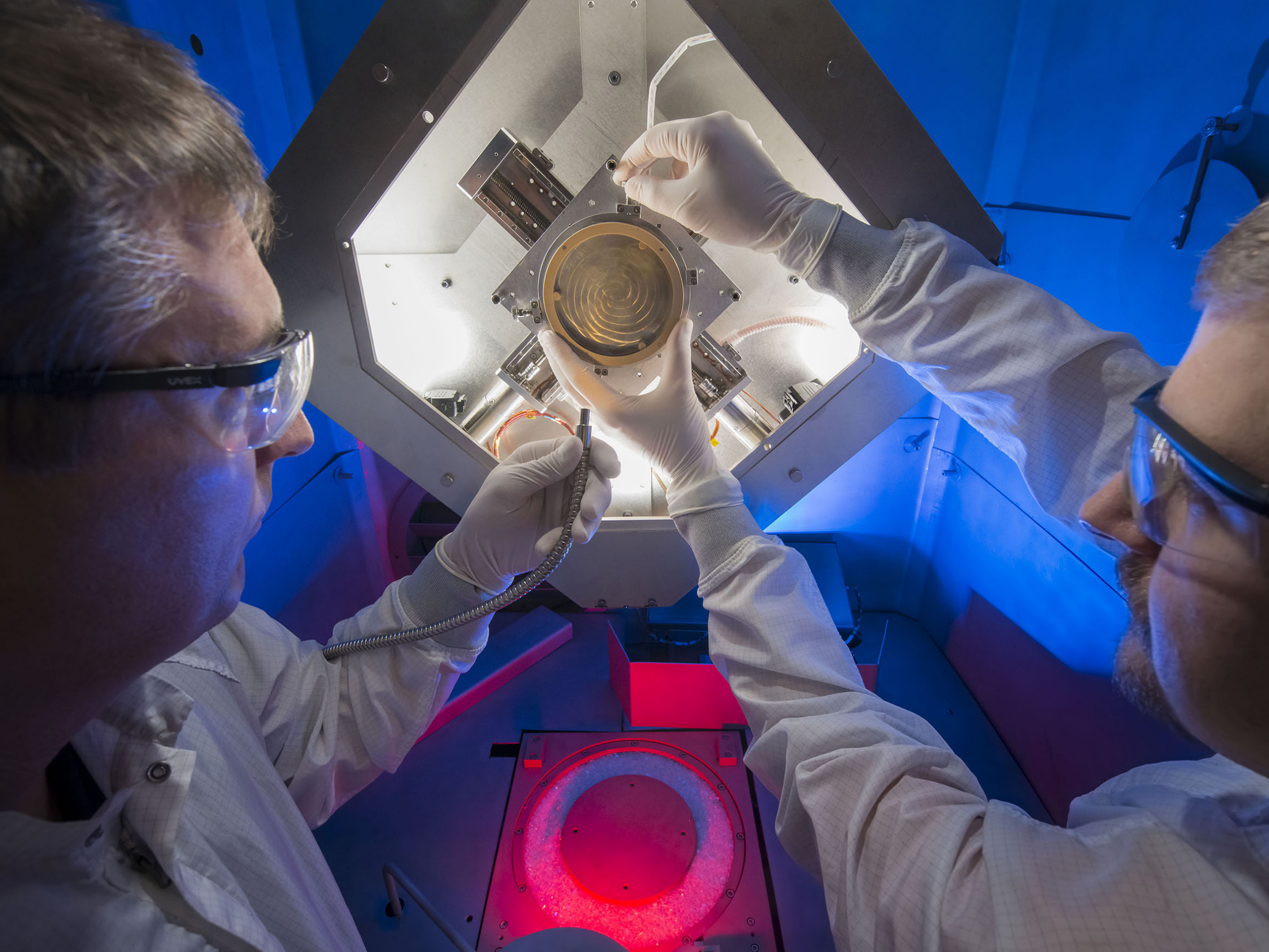
UVEX

GLAD

Optical Manufacturing Process Engineer, John Spaulding, and Coating Operator, Justin Foster, are shown installing an optic on a new prototype stage built to support research and development work on glancing angle deposition (GLAD) coatings. The deposition system is designed to allow for growth of an oriented, birefringent film structure in stripes across an optical surface, and the resulting film thickness is controlled such that each stripe region is a quarter-wave plate.

MAY

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JULY

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30	31					

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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4	5	6	7	8	9 ○	10
11	12	13	14	15	16	17 ◑
18	19	20	21 Summer Solstice	22	23	24 ●
25	26	27	28	29	30 LLE Golf Tournament at Blue Heron Hills	

JUNE 2017

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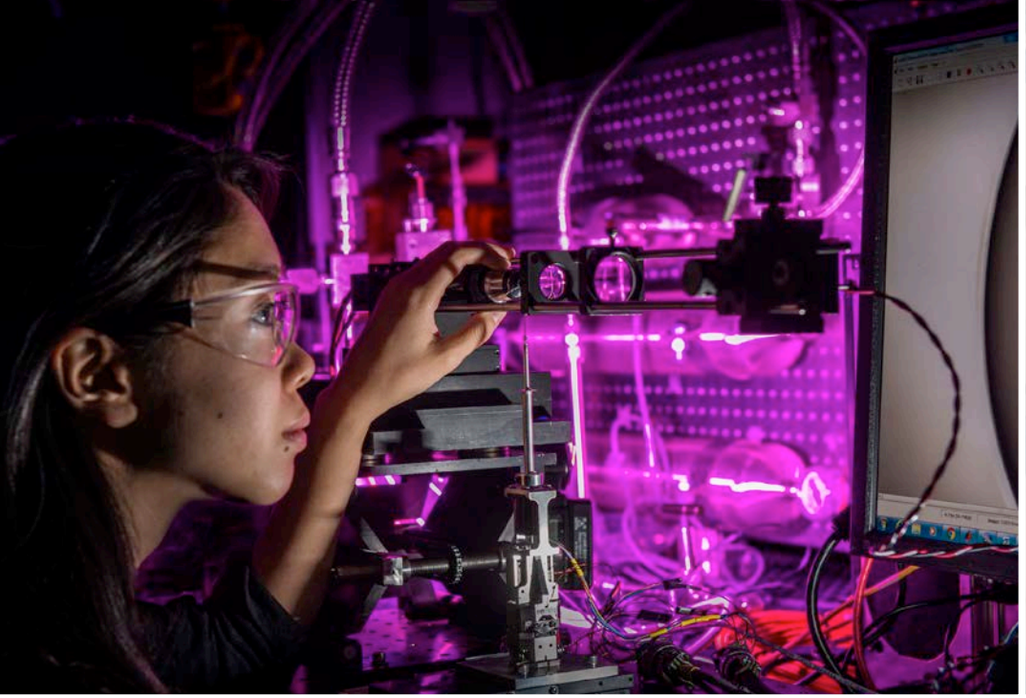

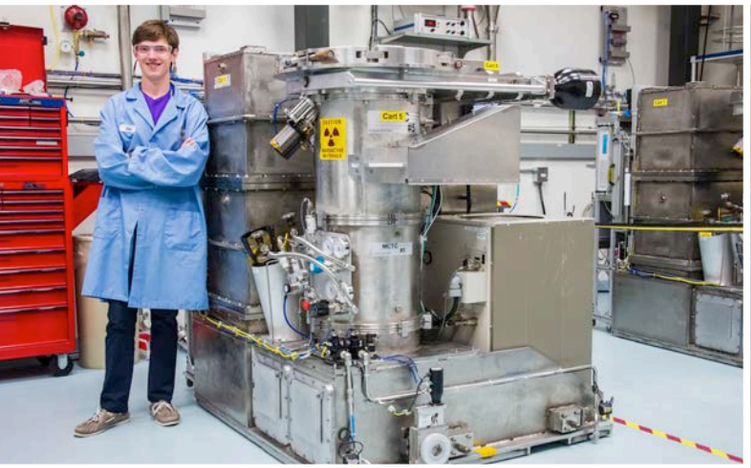


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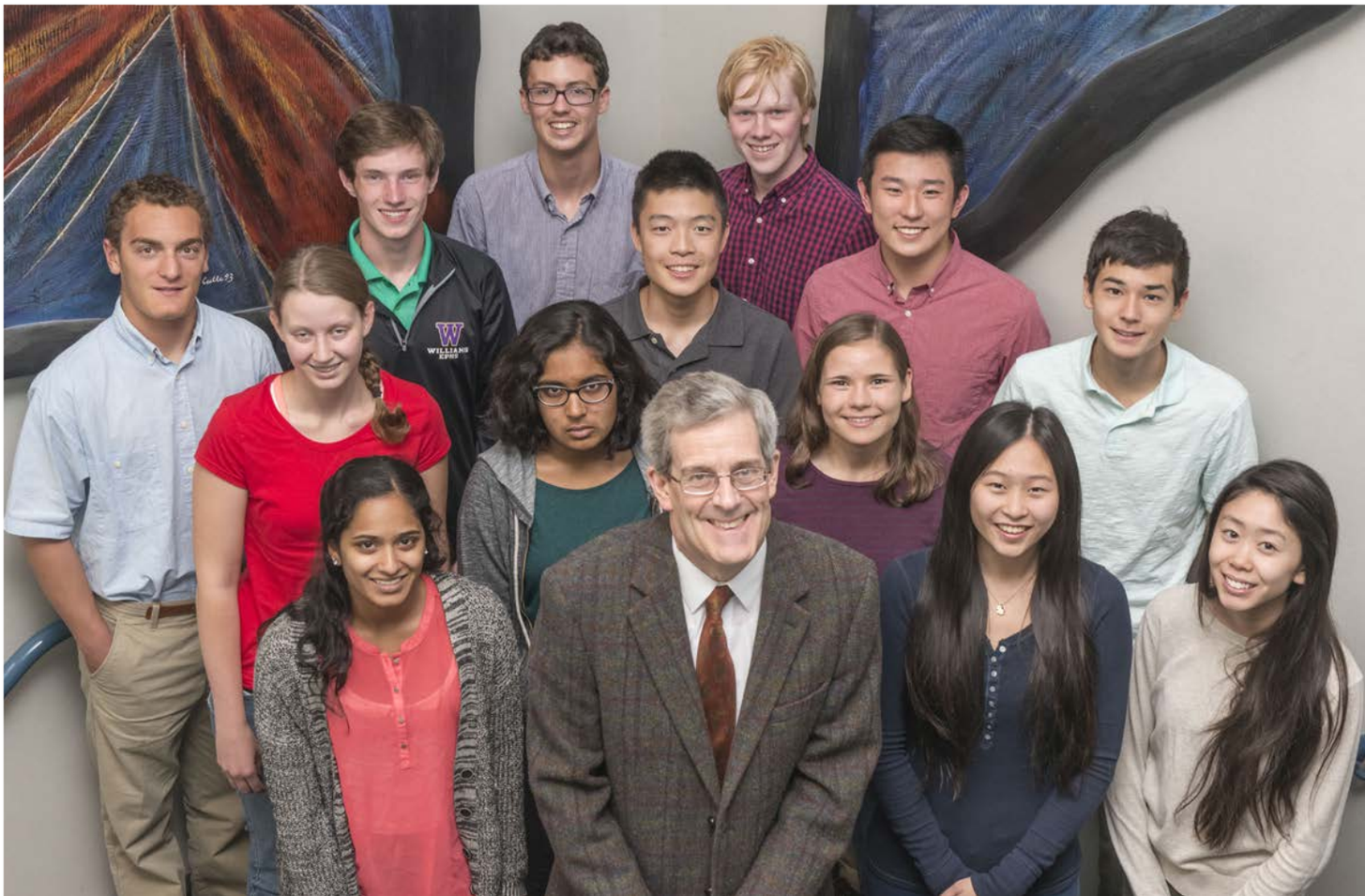

Summer High School Research Program

Thirteen students from Rochester area high schools participated in the 2016 LLE Summer High School Research Program. Since its inception in 1989, 353 high school students have participated in this program. The program is led by Dr. Stephen Craxton, shown above with the students. Insets show some of the research activity engaged by the students.

JUNE

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AUGUST

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SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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2	3	4 Independence Day University Holiday	5	6	7	8
9 ○	10	11	12	13	14	15
16 ◑	17	18	19	20	21	22
23 ●	24	25	26	27	28	29
30 ◐	31					

JULY 2017

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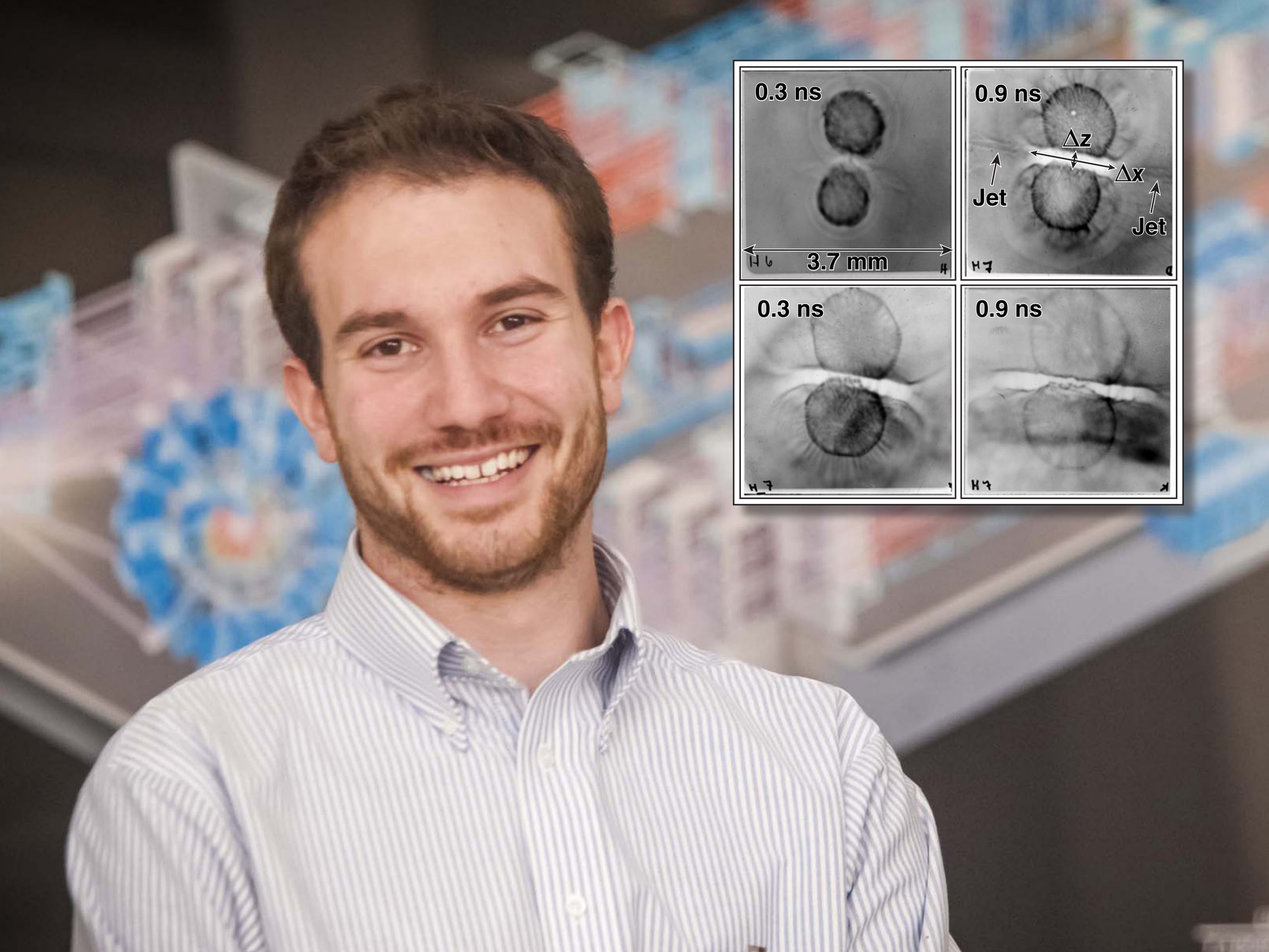
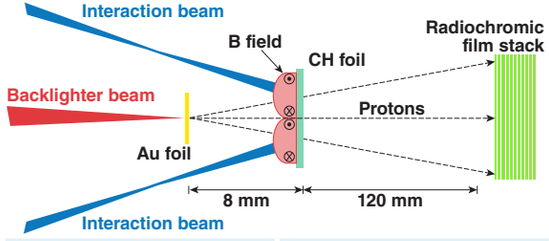

0.3 ns
3.7 mm
0.9 ns
Δz
Δx
Jet
Jet
0.3 ns
0.9 ns

Dr. Michael Rosenberg

Dr. Michael Rosenberg, a new Research Associate at LLE, was selected to receive the prestigious Marshall Rosenbluth Award for Outstanding Doctoral Thesis given by the American Physical Society Division of Plasma Physics. The inset shows some of the work in Rosenberg's thesis, demonstrating magnetic-field reconnection in colliding laser-produced plasmas.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1	2	3	4 LLE Golf Tournament at Deerfield	5
6	7 ○	8	9	10	11	12
13	14	15 ◑	16	17	18	19
20	21 ●	22	23	24	25	26
27	28	29 ◐	30	31		

JULY

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SEPTEMBER

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AUGUST 2017

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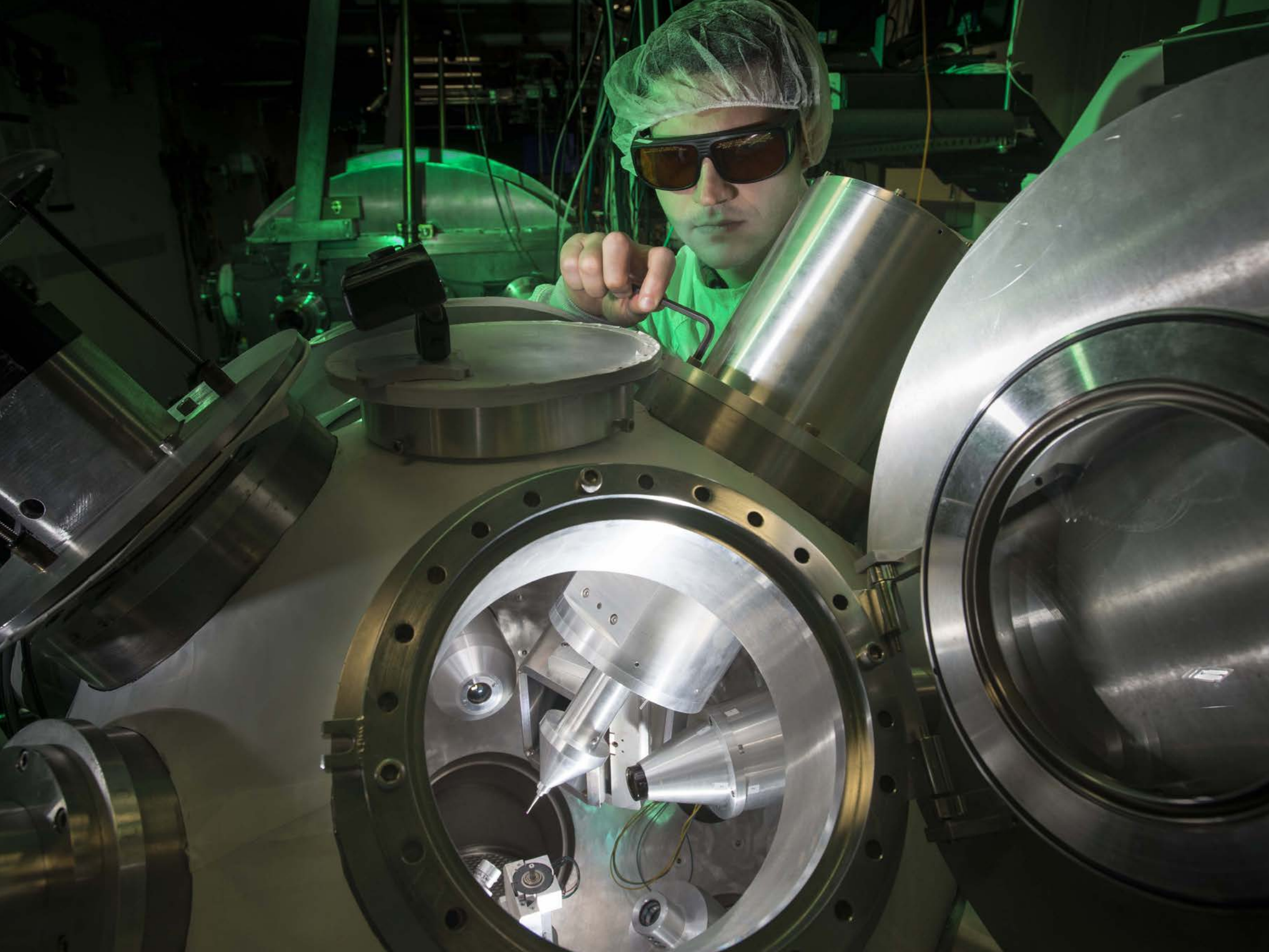

EUV Spectrometer

Research Associate, Dr. Steven Ivancic, is shown at the target chamber securing the extreme-ultraviolet (EUV) spectrometer to the Multi-Terawatt (MTW) laser target chamber. Its nose cone can be seen inside the target chamber. The EUV spectrometer measures emission from targets rapidly heated by the subpicosecond MTW pulse. This is part of the activation of the EUV spectrometer project and the second-harmonic–generation project on the MTW.

AUGUST

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OCTOBER

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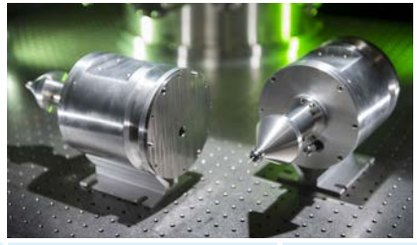
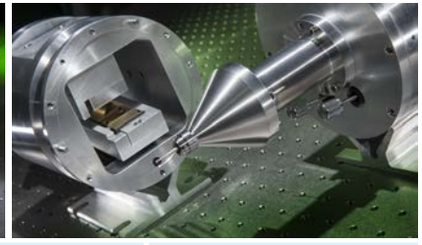
29	30	31				

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 LLE Golf Tournament at Bristol Harbour	2
3	4 Labor Day University Holiday	5	6 ○	7	8	9
10	11	12	13 ◑	14	15	16
17	18	19	20 ●	21	22 Autumnal Equinox	23
24	25	26	27	28 ◐	29	30

SEPTEMBER 2017

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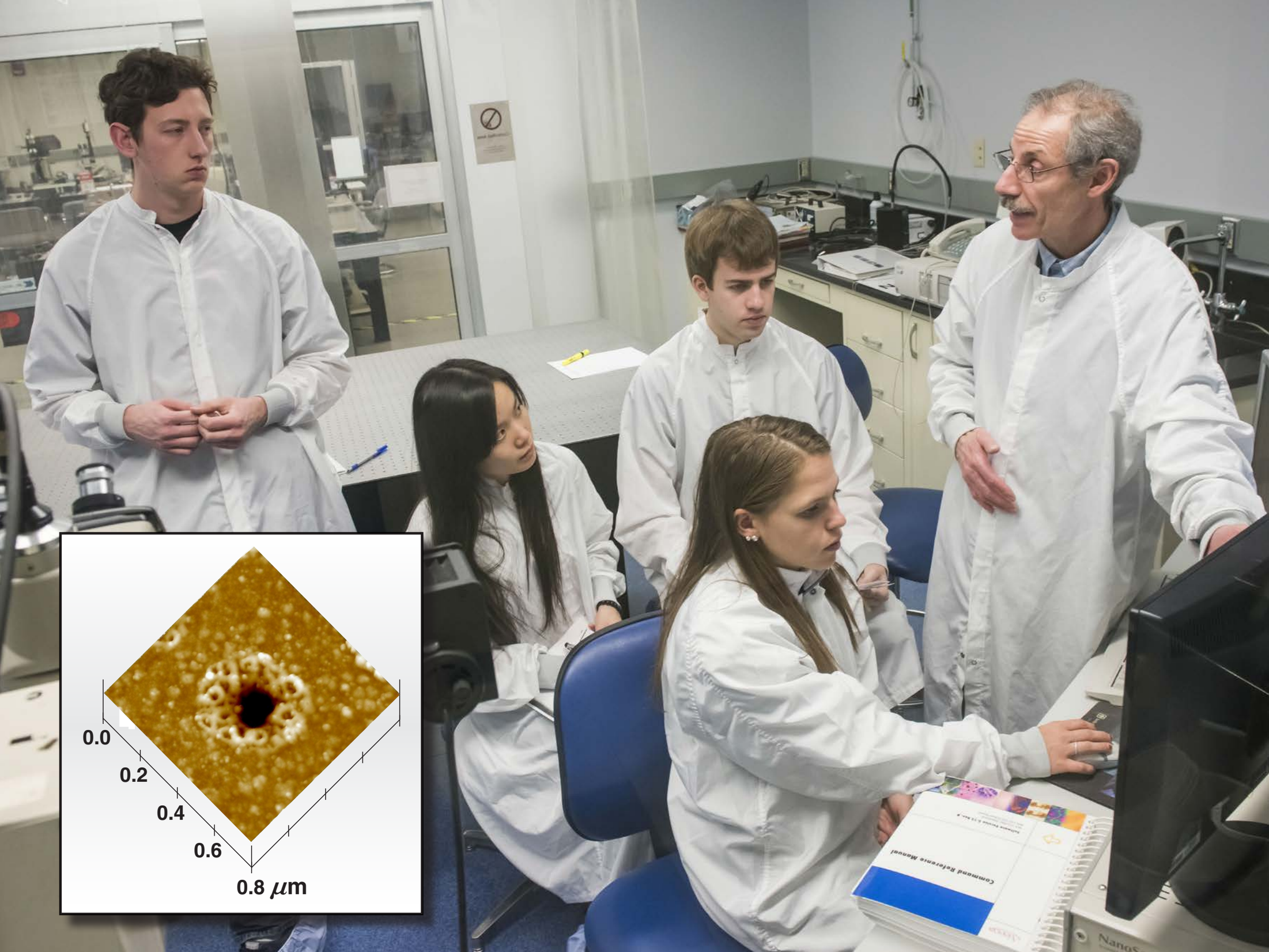
0.0
0.2
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0.8 μm
Command Reference Manual

Studying Nanometrology

LLE Scientist, Dr. Semyon Papernov, is shown here with four of his eight students during a teaching session on atomic force microscopy (AFM). The AFM instruction is part of OPT 254, a required undergraduate laboratory course offered through the Institute of Optics.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	2	3	4	5 ○	6	7
8	9 Columbus Day	10	11	12 ◑	13	14
15	16	17	18	19 ●	20	21
22	23	24	25	26	27 ◐	28
29	30	31				

59th Annual Meeting of the APS Division of Plasma Physics in Milwaukee, WI

SEPTEMBER

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NOVEMBER

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OCTOBER 2017

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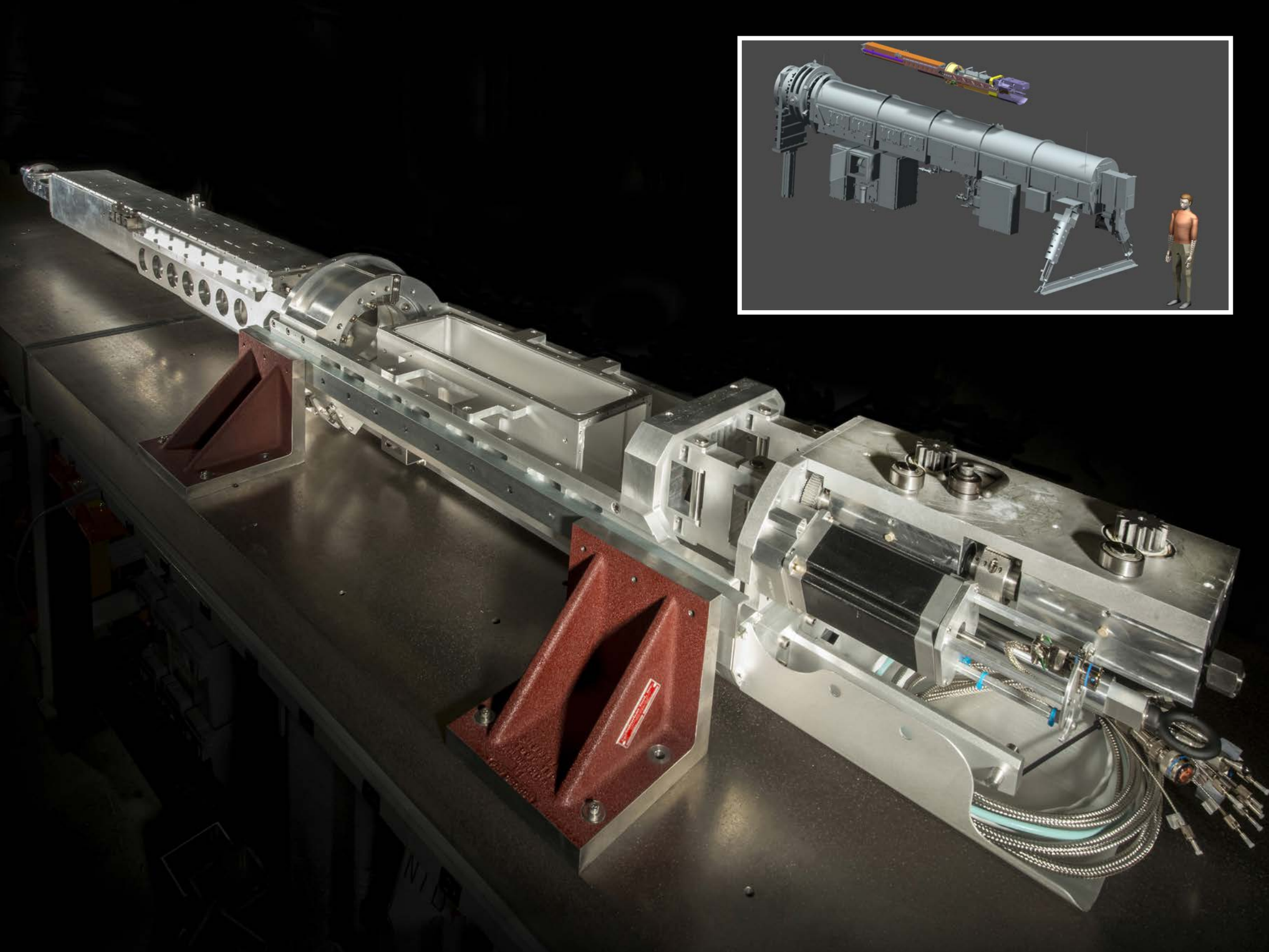
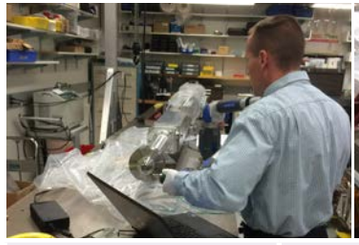
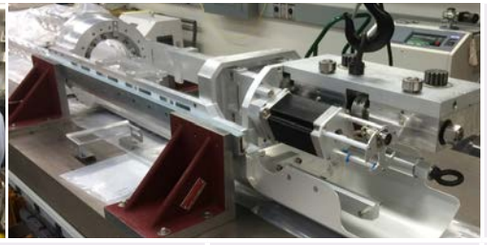


NIF Rotating Cart

LLE redesigned and built a rotating cart (RCART) shown above to be used at the National Ignition Facility (NIF). Many NIF diagnostics must be oriented either vertically or horizontally and RCART facilitates the transition without removing the cart from the diagnostics instrument manipulator—shown in schematic form in the inset.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2	3	4 ○
5 Daylight Savings Time Ends	6	7	8	9	10 Veterans Day ◑	11
12	13	14	15	16	17	18 ●
19	20	21	22	23 Thanksgiving Day University Holiday	24 University Holiday	25
26 ◐	27	28	29	30		

OCTOBER

S	M	T	W	T	F	S
1	2	3	4	5	6	7
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DECEMBER

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31						

NOVEMBER 2017

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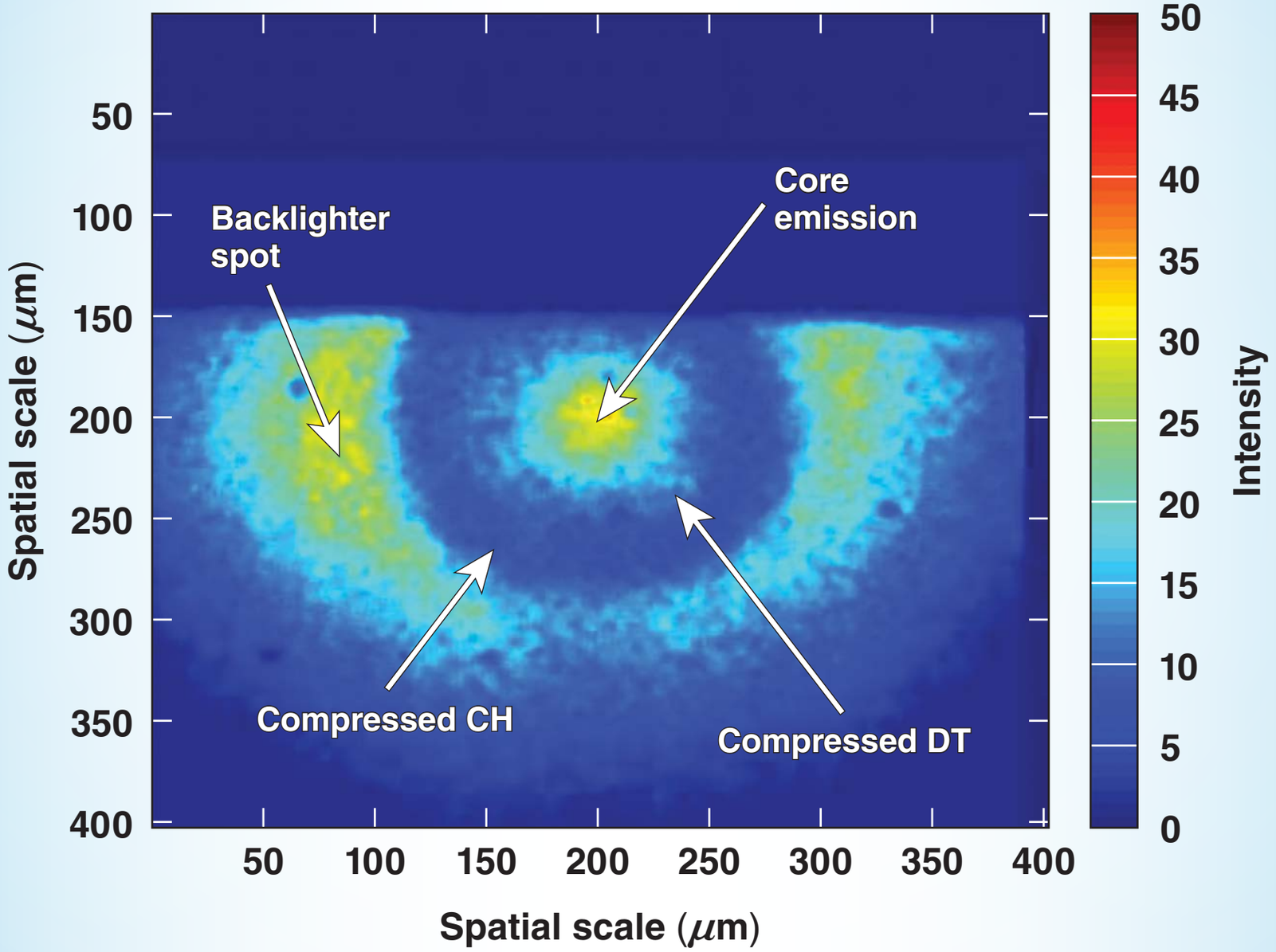
Backlighter spot
Core emission
Compressed CH
Compressed DT
Spatial scale (μm)
50
100
150
200
250
300
350
400
Spatial scale (μm)
50
100
150
200
250
300
350
400
Intensity
50
45
40
35
30
25
20
15
10
5
0

X-Ray Backlighting

Radiograph of a cryogenic implosion recorded with the aberration-corrected narrowband crystal imager on a 40-ps exposure time framing camera at a convergence ratio CR ~ 7. The Si backlighter target was driven by a 20-ps, 1.5-kJ pulse from OMEGA EP. The image is rendered on a linear intensity scale.

NOVEMBER

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JANUARY 2018

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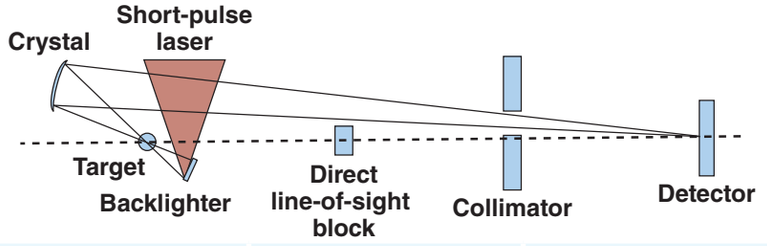

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1	2
3 ○	4	5	6	7	8	9
10 ◑	11	12	13	14	15	16
17	18 ●	19	20	21 Winter Solstice	22	23
24	25 Christmas Day University Holiday	26 ◐	27	28	29	30
31						

DECEMBER 2017

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2018

JANUARY

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FEBRUARY

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MARCH

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APRIL

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MAY

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JUNE

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JULY

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AUGUST

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SEPTEMBER

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OCTOBER

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NOVEMBER

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DECEMBER

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2019

JANUARY

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FEBRUARY

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MARCH

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APRIL

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MAY

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JUNE

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JULY

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AUGUST

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SEPTEMBER

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OCTOBER

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NOVEMBER

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DECEMBER

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