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# The Tenth Omega Laser Facility Users Group Workshop

## Introduction

The Tenth Omega Laser Facility Users Group (OLUG) Workshop was held at the Laboratory for Laser Energetics (LLE) on 25–27 April 2018. It was attended by 130 researchers, including scientists, postdoctoral fellows (postdocs), and students (Fig. 156.38). The attendees represented institutions from five countries, including the U.S., Canada, U.K., France, and Israel. As has been the case for previous workshops, postdocs and students received travel support to attend the workshop from the Department of Energy (DOE) National Nuclear Security Administration (NNSA)

## The Workshop Program

Roberto Mancini, Chair of the OLUG Executive Committee, presented John M. Soures a plaque with the inscription “In recognition of and appreciation for effectively managing, coordinating, and facilitating user programs and experiments at the Omega Laser Facility.” The Omega Laser Facility Users Group Workshop was held in advance of John’s retirement later in

2018 (Fig. 156.39). The OLUG program included the following four invited talks: “Relativistic Electrons and Strong Magnetic



Figure 156.39  
National Laser Users Facility (NLUF) and Laboratory Basic Science (LBS) Manager John Soures is recognized by OLUG.



Figure 156.38  
Group photo of the Tenth Omega Laser Facility Users Group Workshop attendees.

Fields from High-Intensity Laser-Plasma Interaction Experiments Using OMEGA EP,” by Karl Krushelnick (University of Michigan) (Fig. 156.40); “Exploring HED Physics, ICF Dynamics and Laboratory Astrophysics with Multiple Monoenergetic Particle Radiography on OMEGA,” by Chikang Li [Massachusetts Institute of Technology (MIT)] (Fig. 156.41); “Turbulent Magnification and Dynamics of Magnetic Fields in Laser-Produced Plasmas,” by Archie Bott (University of Oxford) (Fig. 156.42); and “Opacity Experiments: From OMEGA to the NIF,” by Robert Heeter [Lawrence Livermore National Laboratory (LLNL)] (Fig. 156.43).



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Figure 156.40  
Karl Krushelnick (University of Michigan) covered relativistic electrons and strong magnetic fields in OMEGA EP.



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Figure 156.41  
Chikang Li (MIT) gave a talk on multiple monoenergetic particle radiography at the Omega Laser Facility.



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Figure 156.42  
Archie Bott (University of Oxford) characterized turbulent magnification and dynamics of magnetic fields.



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Figure 156.43  
Robert Heeter (LLNL) summarized past, present, and future opacity experiments: from OMEGA to the National Ignition Facility (NIF).

DOE’s NNSA perspective was presented remotely by Acting ICF Program Director Njema Frazier. Other highlights included an evening tutorial, “Optical Diagnostics at OMEGA,” offered by Chuck Sorce (LLE) and the LLE engineering team [Figs. 156.44(a) and 156.44(b)]; a facility talk, “Omega Facility Update and Progress on OLUg Recommendations,” by Sam Morse (LLE) (Fig. 156.45); a summary of the OLUg ExCom election results by Mark Koepke [West Virginia University (WVU)] (Fig. 156.46); a professional development talk, “Successful Letters: An Editor’s Perspective,” by Serena Dalena [American Physical Society (APS)/Physical Review Letters (PRL)] (Fig. 156.47); a lunchtime round-table discussion on career opportunities (national laboratory, university, and industry) in high-energy-density science (Fig. 156.48 and

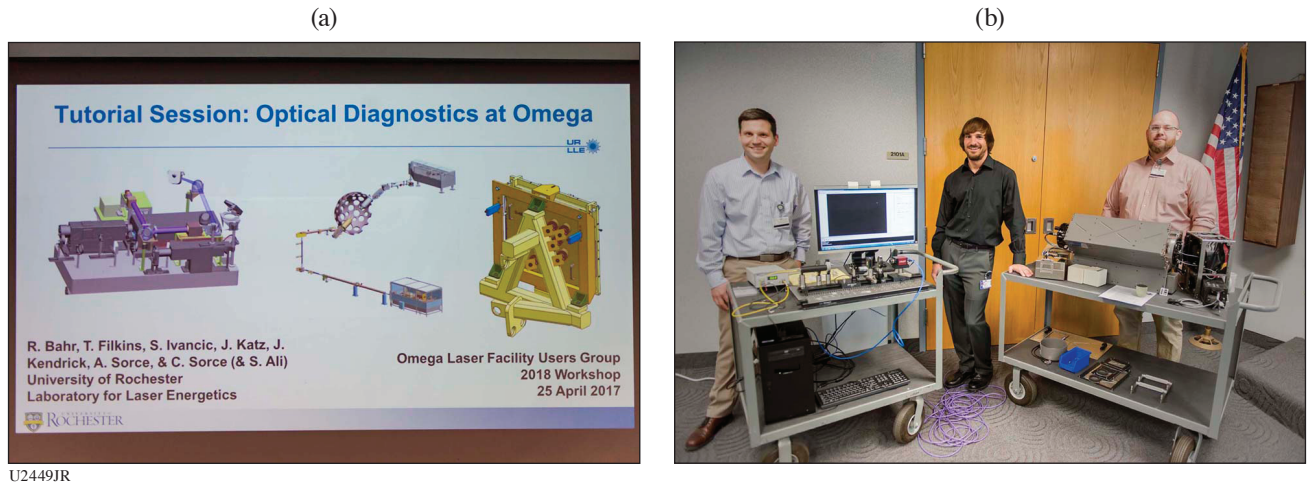
Table 156.III); the student and postdoc panel (Fig. 156.49); and a discussion of OLUG's Findings and Recommendations for LLE management (Fig. 156.50). In addition, LLE staff organized tours of the OMEGA and OMEGA EP lasers (Fig. 156.51).

Student, postdoc, scientist, and facility posters comprised a total of 81 presentations that were organized in three poster sessions. Of the total number, 63 posters were presented by

graduate students, postdocs, and undergraduate students [Figs. 156.52(a)–156.52(c), respectively]. Two additional posters were presented by high school students who had participated in LLE's 2017 Summer High School Research Program (Fig. 156.53).

**Student and Postdoc Poster Awards**

In an effort to promote and reward excellence in young researchers, the posters presented at the OLUG Workshop by



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Figure 156.44 Wednesday evening diagnostics tutorial: (a) overview by Chuck Sorce (LLE) and (b) demonstration by the LLE engineering team.



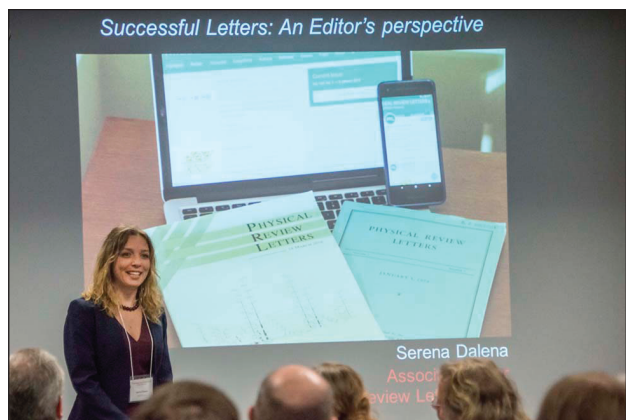
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Figure 156.45 Sam Morse (LLE) delivers the Facility Update and Progress on 2017 OLUG Findings and Recommendations.



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Figure 156.46 Mark Koepke (WVU) explained the annual nominations and election process carried out in the winter of 2017 that led to the election of three new OLUG Executive Committee members.



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Figure 156.47  
Serena Dalena (APS/PRL) helps OLUG workshop participants understand the journal editorial process.



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Figure 156.49  
The student and postdoc panel contributed to the Findings and Recommendations and as offered feedback to OLUG about the experiment-user and workshop-attendee experiences.



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Figure 156.48  
Lunch round-table discussion on career opportunities in high-energy-density science (HEDS).

(a)



(b)



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Figure 156.50  
(a) Maria Gatu Johnson and (b) Channing Huntington led the discussion of 2018 OLUG Findings and Recommendations.

Table 156.III: Panel members of the round-table discussion on careers in HEDS.

National Lab	Bob Heeter and Channing Huntington (LLNL)
National Lab	Kirk Flippo and Elizabeth Merritt (LANL)
University	Rip Collins and Sean Regan (LLE)
University	Petros Tzeferacos (University of Chicago)
University	Mark Koepke (WVU)
University	Johan Frenje and Maria Gatu Johnson (MIT)
University	Carolyn Kuranz (University of Michigan)
Industry	Igor Golovkin (Prism)
Industry	Mingsheng Wei and Mario Manuel (General Atomics)
Europe	Bruno Albertazzi (LULI EC)



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Figure 156.51  
LLE staff organized tours of OMEGA and OMEGA EP. David Canning explains the OMEGA EP Laser System to a group of students and postdocs.

students and postdocs were reviewed and ranked by a committee of scientists. As a result, prizes and honorable mentions were awarded to those posters at the top of the ranking. The following are the awards granted during this OLUG Workshop (Fig. 156.54):

Undergraduate Students

First place (\$250): Katelyn Cook, Houghton College, “A Phoswich Detector System to Measure Sub-Second Half-Lives Using ICF reactions.”

Second place (\$150) (tie): Codie Fiedler-Kawaguchi and Emmeline Douglas-Mann, Bryn Mawr College, “Hydrodynamic Instabilities at an Oblique Interface: Experiments and Simulations” and Jordan Laune, University of Chicago, “Problem Solver: A Nonlinear Proton Radiography Reconstruction Algorithm Implemented in Python.”

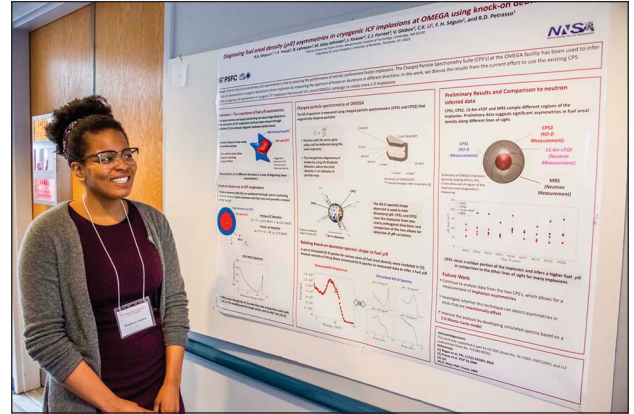
Graduate Students

First place (\$250): Amina Hussein, University of Michigan, “Influence of Plasma Density on the Generation of 100-MeV Electrons Via Direct Laser Ablation.”

Second place (\$150): Patrick Adrian, MIT, “Determination of Ion–Electron Equilibration Rate Through Measurements of Ion Stopping Power Below The Bragg Peak on OMEGA.”

Third place (\$100) (tie): Rui Hua, University of California, San Diego, “Generation of Collisionless Shocks and the Associated Electric Field at Shock Front in a Low-Density Gas System” and Brandon Lahmann, MIT, “Measurement of Ion Stopping Power in Warm Dense Matter Plasmas at Omega.”

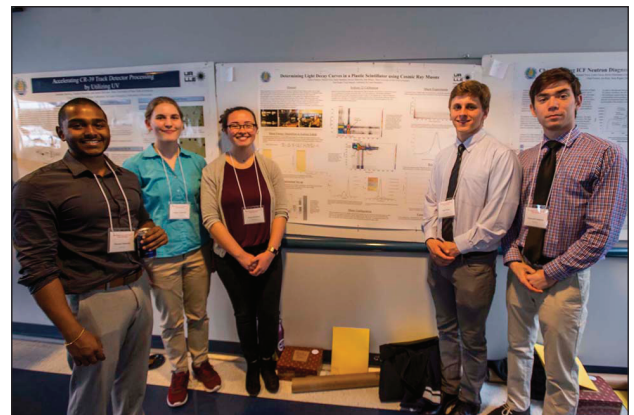
(a)



(b)



(c)



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Figure 156.52  
(a) Graduate student Raspberry Simpson from MIT presents her poster.  
(b) Postdoctoral research associate Maylis Dozieres presents her poster.  
(c) Undergraduate students Praveen Wakwella, Kurt Fletcher, Sarah Mandanas, John Wilson, and Zachariah Barfield from SUNY Geneseo present their poster. Mentor: Steve Padalino (not shown).

Honorable mentions: Neel Kabadi, MIT, “Exploring the Charge and Mass Dependence of Strong Shock Energy Coupling in

Kinetic DT Exploding Pushers at Omega;” Joseph Levesque, University of Michigan, “Measuring Across Shock Fronts Using the Imaging Thomson-Scattering Diagnostic;” and Graeme Sutcliffe, MIT, “Extension of Proton Backlighter

Platform to Three Probe Particles by Using D + T +  $^3\text{He}$ -Filled Capsules.”

Postdoctoral Fellows

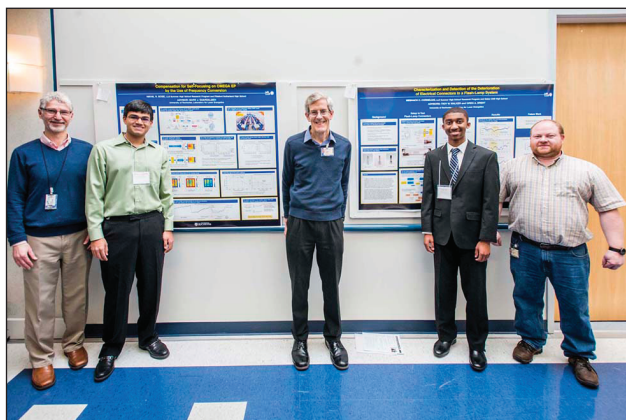
First place (\$250): Hans Rinderknecht (LLNL), “First Measurements of Strong Collisional Plasma Shock Formation.”

Second place (\$150): Bruno Albertazzi [Laboratoire pour l’Utilisation des Lasers Intenses (LULI), France], “Generating a Highly Radiative Shock in the Laboratory.”

Third place (\$100): Christofer Walsh (Imperial College London, UK), “Potential Experiments to Diagnose Deceleration Phase Self-Generated Magnetic Fields.”

**Nominations and Election**

In November 2017, a nominating committee was established to request nominations for the election of three new executive committee (EC) members according to the guidelines of OLUG’s bylaws. The nominating committee was comprised of Mark Koepke (WVU), Chair (Fig. 156.46), Carolyn Kuranz (University of Michigan), and Bob Cauble (LLNL). The nominations for the three new members of OLUG’s EC were



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Figure 156.53  
LLE Summer High School Research Program presenters: (left) Nikhil Bose, Pittsford Sutherland High School, Mentor: M. J. Guardalben. (center) Steve Craxton, LLE Director of the High School Research Program. (right) Meshach Cornelius, Gates Chili High School, Mentors: Troy Walker and Greg Brent.



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Figure 156.54  
Student and postdoc poster awardees, along with Mingsheng Wei and John Soures. Mingsheng Wei led the poster award selection process.

to include one representative from a U.S. university/small business, one representative from a national laboratory/major business, and one junior researcher. Once again, we had an excellent group of nominees who agreed to put their name on the ballot and were willing to serve on the EC if elected. The election resulted in the selection of Petros Tzeferacos from the University of Chicago, Liz Merritt from LANL, and Suzanne Ali from the LLNL as new members of the EC. Taking into account the newly elected members, as well as those who continue from the previous year, the EC of OLUG for the year April 2018–April 2019 includes the following members (Fig. 156.55):

- U.S. university/small business: Mark Koepke (WVU, Chair), Maria Gatu Johnson and Johan Frenje (MIT, Vice Chair), and Petros Tzeferacos (University of Chicago)
- National laboratory/major business: Channing Huntington (LLNL), Mingsheng Wei (General Atomics), and Liz Merritt (LANL)
- Junior researcher: Suzanne Ali (LLNL)
- Non-U.S. researcher: Alexis Casner (University of Bordeaux, France)
- LLE, ex-officio: Jim Knauer



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Figure 156.55

OLUG Executive Committee members. From left to right, front row: Suzanne Ali (LLNL, term starts 29 April 2018), Mingsheng Wei (GA), Roberto Mancini (University of Nevada-Reno, Chair), Maria Gatu Johnson (MIT), Channing Huntington (LLNL). From left to right, back row: Petros Tzeferacos (University of Chicago, term started 29 April 2018), Liz Merritt (LANL, term started 29 April 2018), Johan Frenje (MIT), Mark Koepke (WVU, Vice Chair), and Alex Zylstra (LANL). Not shown are Alexis Casner (University of Bordeaux), Peter Celliers (LLNL), and Jim Knauer (LLE).

The three new EC members replaced Roberto Mancini (University of Nevada-Reno), Peter Celliers (LLNL), and Alex Zylstra (LANL) who stepped down from the EC after completing their terms. The OLUG EC is very grateful to them for their service in the EC and their contributions to the success of OLUG.

### Summary of Findings and Recommendations

An important outcome of OLUG's annual workshop is the list of Findings and Recommendations that OLUG submits for consideration to LLE's management every year. The 2018 Findings and Recommendations are summarized below, including those put forward by the student and postdoc panel (Fig. 156.49). Plans are in place to address most of the 2018 Findings and Recommendations: 5 are complete, 13 are in progress; 1 is deferred due to lack of funding; and 6 have no update or little progress at this time.

1. Increase magnetic fields to 30 T (and up to 50 T) (in progress).
2. Make gas-jet targets available on OMEGA and OMEGA EP (complete).
3. Implement a multiwavelength laser–plasma interaction platform has been implemented on OMEGA by coupling a novel wavelength-tunable laser using an OMEGA EP beam and the application of a gas-jet target (complete).
4. Make several upgrades and improvements to the active shock breakout and streaked optical pyrometer diagnostics (complete).
5. Implement new features in the Omega PI Portal to facilitate data reduction and experimental planning (in progress).
6. Improve Dante and related time-resolved spectrometers (no update).
7. Upgrade warm target tritium filling capability (in progress).
8. Install small phase plates (distributed phase plates) for UV and IR beams on OMEGA EP (in progress).
9. Add opposing beams on OMEGA EP (deferred).
10. Consider an absolute calibration of the Raman backscatter diagnostics (no update).
11. Implement a planar cryogenic system on OMEGA EP (in progress).

12. Consider adding magnification options for the VISAR diagnostic (in progress).
13. Acquire a new Rochester Optical Streak System streak camera and optics upgrade for the PXTD (in progress).
14. Improve fuel  $\rho R$  measurements on D<sub>2</sub> implosions (improved measurements of secondary DT neutrons) (no update).
15. Maintain and improve the imaging x-ray Thomson-scattering diagnostic, including procurement of a backup crystal, shielding, and crystals for different energy ranges (in progress).
16. Relocate the charged-particle spectrometer CPS1 to a new port on the western hemisphere (in progress).
17. Improve measurement of stacked pulses on OMEGA EP (complete).
18. Periodically calibrate the image plates and scanners used for several diagnostics (in progress).
19. Add metric labeling to engineering drawings (no update).
20. Add Thomson-scattering  $4\omega$  random phase plates with absolute calibration (in progress).
21. Support the new DT<sup>3</sup>He multi-particle backlighter platform (complete).
22. Convert hdf4 files to hdf5 format (no update).
23. Acquire software for users to model the  $4\omega$  diagnostic (in progress).
24. Review publicity/advocacy efforts of LLE/OMEGA (in progress).
25. Improve support for radiochromic film analysis for proton probing experiments on OMEGA EP (no update).

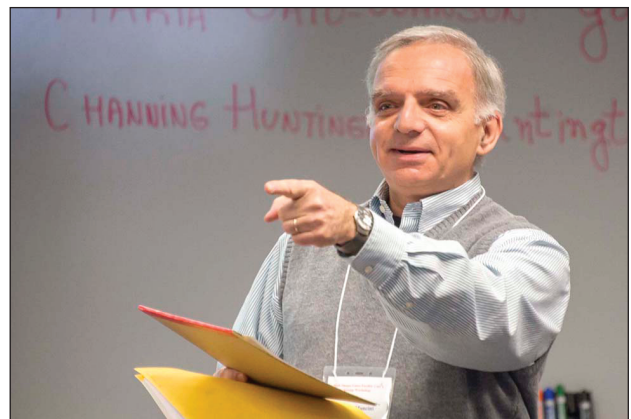
Mike Campbell (Fig. 156.56) was pleased with the record attendance and record number of poster presentations at the 2018 OLUG Workshop. Roberto Mancini (Fig. 156.57) succeeded in recruiting excellent lecturers and introducing new program elements into OLUG 2019.



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Figure 156.56

LLE Director Mike Campbell delivers his remarks to the OLUG workshop participants.



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Figure 156.57

OLUG Chair Roberto Mancini (University of Nevada-Reno) adjourned the workshop, announcing the mid-year OLUG meeting at the 2018 APS Division of Plasma Physics conference (6 November) and the next annual OLUG Workshop, 24–26 April 2019.

## ACKNOWLEDGMENT

This OMEGA Laser Facility Users Group Workshop was made possible in part by the generous support of the National Nuclear Security Administration of the U.S. Department of Energy for travel expenses of students and postdocs; by the Physics Department at the University of Nevada-Reno; and by the Laboratory for Laser Energetics at the University of Rochester for the use and availability of critical resources and support. In addition, OLUG thanks the LLE management for their responsiveness to our Findings and Recommendations. For capturing through his lens the workshop ambiance, OLUG thanks Eugene Kowaluk. Mark Koepeke is the editor for this Proceedings.