SYMPOSIUM ON UNDERGRADUATE RESEARCH

Division of Laser Science of A.P.S - LS XXVIII - 15 October 2012 - Rochester, NY

PARTICIPANTS' LUNCHEON - Highland B - 12:00

The participants' luncheon will bring together the Symposium students and distinguished laser scientists, including Paul Corkum, David Williams, Joe Eberly, Carlos Stroud, Henry Kapteyn, and Marlan Scully.

Box lunches will be provided for participants and invited guests only.

REMINDER: Group Photo Break 2:55 – 3:00 PM - PLEASE assemble at the designated place!!!

POSTER SESSION - Riverside Court - 12:30

Session LM2A: 12:30 - 2:55 PM, Riverside Court – Nick Bigelow, Univ. Rochester, Presider

LM2A1 - Optical Square-Wave Dynamics and Stability in Vertical-Cavity Surface-Emitting Lasers (VCSELs). *Brenton Pope, Taylor Gilfillan, and David W. Sukow, Washington and Lee University, Lexington, VA 24450.* Feedback-induced optical square-waves in VCSELs typically display instabilities in the waveform and switching time. We present experimental observations of these dynamical phenomena, and compare with numerical simulations based on the spin-flip rate equation model. Supported by NSF and Washington and Lee University.

LM2A2 - Ray Transfer Matrix for the Spiral Phase Plate. *Michael Eggleston and Mishkat Bhattacharya, Department of Physics, Rochester Institute of Technology, Rochester, NY 14623*. We present a ray transfer matrix for the spiral phase plate. Using this result we obtain the stability conditions for a resonator made of a spiral phase plate and a spherical mirror. Supported by the Research Corporation for Science Advancement.

LM2A3 - Laser-Induced Desorption of Amorphous Solid Water and NO_2 at 125 K. *Daniel Kwasniewski[1], Stephanie McKean[2], Jaimie Stomberg[2], Curt Wittig[2], and Hanna Reisler[2], 1) Department of Chemistry, Alvernia University, Reading, PA 19607, 2) Department of Chemistry, University of Southern California, Los Angeles, CA 90007.* This study reports laser-induced desorption of Amorphous Solid Water (ASW) doped with N_2O_4. We study energy transfer from ultraviolet excited N_2O_4 to ASW on MgO and Cu substrates. Temporal profiles of ablated molecules were analyzed using Time of Flight Mass Spectrometry under ultrahigh vacuum conditions at ~125 K. Supported by NSF-REU and University of Southern California.

LM2A4 - Chaos Synchronization in Multimode Vertical-Cavity Surface-Emitting Lasers. *Matthew Valles and Hong Lin, Bates College, Lewiston, ME 04240.* We experimentally studied chaos synchronization between two vertical-cavity surface-emitting lasers (VCSELs) in the multimode regime. The control parameters include frequency detuning, feedback strength, and injection power. The highest correlation coefficient is 0.85. We also studied the behavior of individual transverse modes in synchronization. Supported by NSF.

LM2A5 - Dynamics of a Current Modulated Multi-Mode Vertical-Cavity Surface-Emitting Laser (VCSEL) Subject to Optical Feedback. *Myles Black-Ingersoll, Alexandra Hakusui, and Hong Lin, Department of Physics and Astronomy, Bates College, Lewiston, ME 04240.* We studied the polarization dynamics of a VCSEL with both optical feedback and current modulation. For most modulation frequencies, we observed coexistence of modulation and feedback dynamics. Resonance between modulation and feedback dynamics was found for a few frequencies. Supported by NSF.

LM2A6 - The Hydrogen Molecular Ion in an Intense Elliptically Polarized XUV Laser Pulse. *Ryan DuToit, Xiaoxu Guan, and Klaus Bartschat, Drake University, Des Moines, IA 50311.* We investigate how H_2^+ reacts when exposed to an intense, ultra-short laser pulse. By numerically solving the Schrödinger equation via a finite-element method, we study the survival probability and the ionized electron distribution as a function of the laser intensity and its ellipticity relative to the molecular axis.

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LM2A7 - Freeform Lens Design for LED Street Lighting. *David Oles, Cristina Canavesi, and Jannick P. Rolland, The Institute of Optics, Univ. of Rochester, Rochester NY 14627.* We studied the design and optimization of freeform lenses for LED street lighting. By creating an array of LED and optimized lens pairs, we observed that the effect of different array configurations on the overall illuminance distribution is small compared to the effect of the shape of the individual lenses. Supported by NSF I-Corps.

LM2A8 - Two-Photon Optogalvanic Spectroscopy of High Lying Levels in Thorium II. *Alec Tewsley-Booth, Pauli Kehayias, and Dmitry Budker, University of California, Berkeley, CA 94720.* We demonstrate a method to probe unobserved high energy levels in Th^+ using a single laser beam. Using a frequency-doubled pulsed dye laser, we excite two-photon transitions from the ground state to predicted states, and detect the transition via the optogalvanic effect. Supported by University of California, Berkeley.

LM2A9 – Characterizing Optical Vortices with a Nine-Aperture Interferometer. *Jonathan Preston[1,2], Martin G. Cohen [2], and John Noé [2], 1) City College of New York, New York, NY 10031, 2) Laser Teaching Center, Stony Brook University, Stony Brook, NY 11794*. The $e^{il\varphi}$ phase variation of an optical vortex beam incident on one or more apertures can produce interference patterns characteristic of topological charge *l*. We have extended recent work by Berkout and Beijersbergen (2008) to 9 small circular apertures and charge 4. Each *l* produced a pattern with unique central features. Supported by the Laser Teaching Center.

LM2A10 – Using the Moire Effect for Wavefront Sensing. *Ariana Ray [1,2], Martin G. Cohen [2], and John Noé [2], 1) Hastings High School, Hastings, NY 10706, 2) Laser Teaching Center, Stony Brook University, Stony Brook, NY 11794.* This research was motivated by an interest in moiré effects, which can occur when two periodic patterns overlap with an angular offset. We have simulated a variety of moiré effects in Mathematica and are investigating methods for wavefront sensing using moiré effects and Talbot self-imaging. Supported by Simons Foundation.

LM2A11 – Quantum Key Distribution Using an Eight-Port Interferometer. *Daniel Mulkey[1], Sven Aeschlimann[1], M. G. Raymer[1] and Jaewoo Noh[2], 1) University of Oregon, Eugene OR 97403, 2) Inha University, South Korea.* We constructed an eight-port interferometer that enables each photon to carry two bits of information for one-time-pad key distribution. Switching between bases performs a discrete Fourier transform.

LM2A12 – Using STIRAP to Excite Helium to Rydberg States. *James Dragan, Yuan Sun, and Harold Metcalf, Stony Brook University, Stony Brook, NY 11794-3800.* We excite a beam of 2^3S metastable helium atoms to Rydberg States (n=15 - 50) using Stimulated Rapid Adiabatic Passage. It is done as atoms pass through two, slightly overlapped laser beams at λ~796 nm and λ~389 nm in the counter-intuitive order, coupled by the intermediate 3^3P state. Supported by ONR.

LM2A13 – Compressive Sensing on the Fly. *Matthew Ware[1], Gregory Howland[2], and John Howell[2], 1) Illinois State University, Normal, IL 61790 2) University of Rochester, Rochester, NY 14627.* Using the In-Crowd algorithm with the Gradient Pursuit for Sparse Reconstruction algorithm as its subsolver, reconstructions of 32x32 pixel images are done on the order of a hundredth of a second. This opens up the possibility of using compressive sensing to record video in real time with a single-pixel camera. Supported by NSF.

LM2A14 – Classical Mechanics of Optomechanical Systems. *Okechukwu S. Igbokwe, Mishkatul Bhattacharya, Rochester Inst. of Technology, Rochester, NY 14623.* We study the classical dynamics of two optomechanical systems consisting of Fabry-Perot cavities with either a moveable end mirror or a centrally placed membrane. We use linearization, Lyapunov stability theory, and Lyapunov exponents to analyze these systems. Supported by McNair Scholars Program and RIT.

LM2A15 – High-Resolution Interference in Quantum Dot Thin-Films. *Danielle Sofferman and Sean J. Bentley, Department of Physics, Adelphi University, Garden City, NY 11530.* We have examined nonlinear responses of a variety of quantum dot samples for applications in optical lithography. High-resolution interference patterns were inscribed onto the thin- films of the samples.

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LM2A16 – Double-Slit Quantum-Eraser Using Momentum-Entangled Photons. *Sajan Shrestha, Sean J. Bentley, Adelphi University, Garden City, NY 11530.* Momentum-entangled photons are produced by Type II spontaneous parametric down-conversion (SPDC) and which-slit information is encoded by directly correlating the transverse spatial modes of the signal and idler beams. Erasure is achieved by superimposing two halves of the idler beams using a symmetric beam splitter.

LM2A17 – Anisotropy in Vanadium Dioxide Thin Films Grown on Rutile. *Evan Crisman, Irina Novikova, Ale Lukaszew, College of William & Mary, Williamsburg VA 23185.*We report anisotropy in optical and electrical properties of a Vanadium Dioxide thin film grown on crystalline rutile substrate at the metal-insulator transition. Comparative measurements on polycrystalline quartz substrate show no anisotropy. These results help further our understanding of the Vanadium Dioxide metal-insulator transition.

LM2A18 – Nondestructive OCT Imaging and Metrology of Polymeric Layered GRIN Materials. *Ke Xu, Jianing Yao, and Jannick Rolland, University of Rochester, Rochester, NY 14627.* We performed high resolution 3D imaging of polymeric layered GRIN materials using OCT to nondestructively characterize their internal structures. From the imaging data, the layer thickness profiles of the samples were measured to provide feedback and guide iteration of the manufacturing process. Supported by DARPA MGRIN program.

LM2A19 – Development of a Simple and Intuitive Approach to Calculating Strong Field Ionization. *Tamas Rozgonyi[1], William Lunden[2], and Thomas Weinacht[2], 1) Chemical Research Center of the Hungarian Academy of Sciences, Budapest, 2) Stony Brook University, Stony Brook, NY 11794-3800.* We have developed a simple and intuitive approach to calculating strong field ionization of model atomic and molecular systems with shaped ultrafast laser pulses. The calculations combine strong field multiphoton coupling between bound states and a discretized continuum, and include dynamic Stark shifts and Freeman resonances. Supported by the NSF.

LM2A20 – Single-Emitter Fluorescence in Nanostructures for Single Photon Source Applications. *Dilyana Mihaylova[1], J. Winkler[1], S.G. Lukishova[2], Z. Shi[2], and K. Shom[3],1) Department of Physics and Astronomy, University of Rochester, Rochester NY 14627, 2) The Institute of Optics, University of Rochester, Rochester NY 14627, 3) [3]Department of Electrical and Computer Engineering, University of Rochester, Rochester NY 14627.* We studied fluorescence of several types of single emitters emitting single photons at a time (colloidal quantum dots, single-walled carbon nanotubes and NV-color-centers in nanodiamonds) in different nanostructures including plasmonic nanostructures. We also did computer based modeling of the electric field enhancement in plasmonic porous membrane and plasmonic bow-tie nanoantennas.

LM2A21 – Exploiting Polarization Spectroscopy and Dispersive Lineshapes to Infer the $5^2P_{3/2}$ F=3 Lifetime in ^{87}Rb. *Cooper Sinai-Yunker and John Brandenberger, Lawrence University, Appleton, WI 54911.* Utilizing Doppler-free polarization spectroscopy and dispersive lineshapes, we have measured the $5^2P_{3/2}$ F=3 lifetime of ^{87}Rb to be 26.3 ± 1.5 ns. To infer this value, we fitted a theoretical lineshape derived from a two-level density matrix analysis to experimental low-power spectra. Supported by NSF/TUES and a Dale L. Skran, Sr. Summer Research Fellowship.

LM2A22 – Stark Mapping of Rubidium Atoms. *Alexandra Friant, Xilei Kuang, Alexander Chartrand, and Michael W. Noel, Bryn Mawr College, Bryn Mawr, PA 19010.* Lasers at specific wavelengths are shone through optics into a Magneto-Optical Trap to excite Rydberg states. We scanned through an electric field, mapping the stark splitting of the 35f state. Supported by NSF.

LM2A23 – The Orbital Hall Effect of Light. *Stefan Evans[1,2], Nathan Brady[1,3], Giovanni Milione[1], and Robert R Alfano[1], 1) Institute for Ultrafast Spectroscopy and Lasers, Physics Department, City College of New York, New York. NY 10031, 2) Laser Teaching Center, Stony Brook University, Stony Brook, NY 11794, 3) University of Nebraska Kearney, Kearney, NE 68849.* We demonstrate an optical analog of the spin Hall effect for a light beam bearing orbital angular momentum (OAM) – the orbital Hall effect of light. This OAM dependent beam shift is directly related to the Poynting vector skew angle and Gouy phase dependent rotation of a Laguerre-Gaussian light beam. Supported by Army Research Office, Corning, Inc., and NASA Nebraska Space Grant.

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LM2A24 – Experimental Study of Short Time Effects in Brownian Motion. *Camilo Perez, Simon Kheifets, Akarsh Simha, and Mark G. Raizen, University of Texas at Austin, Austin, TX 78712.* We have studied optically trapped beads in water with high resolution and at short time scales. In equilibrium, this allows for the observation of the transition into the ballistic regime of Brownian motion and in a driven system it allows the study of hydrodynamics at short time scales.

LM2A25 – Optical Losses in a Simple Fiber-to-Cavity Coupling Scheme. *Eric Knudsen, Ali Khademian, and David Shiner, University of North Texas, Denton TX 76203.* We studied schemes for coupling light from fiber into the asymmetric Gaussian mode of a ring resonator used for harmonic generation. Optical fibers are Brewster polished to eliminate Fresnel losses. Separate experiments were performed to characterize limitations due to the distortions of the molded glass aspheric lenses used for coupling. Supported by NSF-REU.

LM2A26 – Negatively Charged Nitrogen Vacancy (NV^-) Centers in Diamond as Magnetic Field Sensors. *Maria Simanovskaia, Kasper Jensen, Andrey Jarmola, and Dmitry Budker, Physics Dept., University of California, Berkeley, CA 94720-7300.* NV^- centers in diamond is a promising system for magnetometry with potential for high spatial resolution. Investigations of recently observed side-band structures in the optically detected magnetic resonance signals give valuable insight to interactions of the NV^- center with its environment. Supported by NSF, AFOSR/DARPA, IMOD, NATO and SURF.

LM2A27 – Slow Light Enhanced Image Rotation in Ruby. *Stephanie Swartz[1], Zhimin Shi[2], Mohammad Mirhosseini[2], and R.W. Boyd[1,2,3], 1) Department of Physics and Astronomy, University of Rochester, Rochester, NY 14627, 2) Institute of Optics, University of Rochester, Rochester, NY 14627, 3) Department of Physics and School of Electrical and Computer Engineering, University of Ottawa, Ontario K1N 6N5, Canada.* We study the rotation of an optical beam by propagating through a rotating slow-light medium – specifically, a ruby crystal. Both a bright beam and a beam with a dark fringe in the center are used. We have observed two very different phenomena, which are explained by different physical mechanisms. Supported by Defense Threat Reduction Agency-Joint Science and Technology Office for Chemical and Biological Defense.

LM2A28 – Relating Nonlocality and Multipartite Entanglement in Different 3-Qubit Quantum States. *William Konyk and Shohini Ghose, 1)Miami University, Oxford OH 45056, 2) Wilfrid Laurier University,Waterloo, Ontario N2L 3C5, Canada.* We study multipartite quantum correlations by numericallyexploring the connection between nonlocality, measured by the Svetlichny inequality, and multipartite entanglement, measured by thethree tangle and linear entropy, with regard to several 3-qubit quantum states. In addition, bounds on measurements which yield amaximum violation of the inequality are discussed. Supported by theNatural Sciences and Engineering Research Council of Canada (NSERC).

LM2A29 – Oscillations in the Dipole-dipole Interaction. *Alexander D. Camps, Thomas J. Carroll, Donald P. Fahey, Michael W. Noel; 1) Ursinus College, Collegeville, PA 19426, 2) Bryn Mawr College, Bryn Mawr, PA 19010.* We excite ultra-cold rubidium atoms to a coherent superposition of 32d(j=5/2) magnetic sub-levels. The atoms exchange energy resonantly via the dipole-dipole interaction. We observe oscillations in the final p-state population that depend on the energy separation between the sub-levels. Simulations of the many-body wave function are compared to data. Supported by NSF.

LM2A30 – Bipartite Entanglement of Three Driven, Damped Two-Level Atoms in Free Space. *Ethan Stanifer and James Clemens, Dept. of Physics, Miami University, Oxford, OH 45056.* We calculate the bipartite entanglements of a system of three two-level atoms with one atom driven using a quantum trajectory simulation derived from the superradiance master equation. There are two sources of the entanglement: the dipole-dipole coupling and the inability to distinguish which atom spontaneously emitted.

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LM2A31 – Laser Frequency Locking Using a Transfer Cavity. *Dale Fox[1], Marek Haruza[2], and Nicholas P. Bigelow[2], 1) Northwestern University, Evanston, IL 60208, 2) University of Rochester, Rochester, NY 14627.* We frequency-stabilize a diode laser using a commercially-stabilized HeNe laser and a Fabry-Perot cavity, the scanning of which enables precise measurements of the frequency offset between the two lasers and allows creation of a correction voltage to lock the diode laser frequency. Supported by NSF.

LM2A32 – Linewidth Measurement for an Interference-Filter-Stabilized External-Cavity Diode Laser. *Louis Baum, Justin T. Schultz, Azure Hansen, and Nicholas P. Bigelow University of Rochester, Rochester, NY 14627.* We present a self-heterodyne linewidth measurement for an interference-filter-stabilized external-cavity diode laser to confirm functionality in selectively exciting atomic transitions. The use of an interference filter permits wavelength tuning without altering the output beam direction. A monolithic design is hoped to improve stability when faced with environmental resonances. Supported by NSF.

LM2A33 – Frequency-Stabilized External-Cavity Diode Lasers for an Undergraduate Teaching Laboratory Magneto-optical Trap. *Peter Heuer, Maitreyi Jayaseelan, Justin T. Schultz, Marek Haruza, Azure Hansen, and Nicholas P. Bigelow, University of Rochester, Rochester NY, 14627.* Two external-cavity diode lasers were built for an undergraduate teaching lab Rubidium MOT. The lasers were frequency stabilized and linewidth narrowed by locking to the D2 transition of a Rubidium 87 saturated absorption spectrum using a homemade locking circuit. Supported by NSF and the Donaldson Trust.

LM2A34 – Crystallization Stability in the (Sb2S3,As2S3)-GeS2-PbS Glass Systems. *Andrew K. Buff[1], J. David Musgraves[1], and Kathleen Richardson[1,2], 1) School of Materials Science and Engineering, COMSET, Clemson University, Clemson, SC 29634, 2) College of Optics and Photonics, CREOL, University of Central Florida, Orlando, FL 32816.* Glasses in the (As_2S_3,Sb_2S_3)-GeS_2-PbS systems were investigated to determine crystallization stability and homogeneity. Crystallization was characterized using DSC and Raman Spectroscopy. Arsenic(As)-containing glasses were found to have poor homogeneity and were very stable to crystallization while the Antimony(Sb)-containing glass showed good homogeneity and controllable crystal growth. Supported by NSF-IREU .

LM2A35 – Holographic Collimation of Light Emitted from an Engineered Diffuser™. *Thomas Mittiga[1], M.G. Cohen[1], and David Battin[2], 1) Stony Brook University, Stony Brook, NY 11794, 2)* Island Holographics, Northport, NY 11768. The Engineered Diffuser™ (ED), an array of individually designed and arranged microlenses, diffuses light into arbitrarily shaped divergent beams. While useful in themselves, collimating ED beams would greatly increase their utility. This novel experiment investigates the use of holography to collimate a square beam produced by an ED. Supported by ONR.

LM2A36 – Laser Locking to the Sr Resonant Transition. *Jarom Jackson, Christopher Erickson, James Archibald, and Dallin S. Durfee, Brigham Young University, Provo, UT 84602.* We are preparing lasers for use in a Sr+ ion interferometer. The 461 nm light used for laser cooling is generated from a doubled IR laser. The laser is locked to a doubling optical cavity which is then controlled with feedback from a vapor cell to lock the laser frequency.

LM2A37 – Investigating the Characteristics of Fluid Diffusion on Microscopic Scales. *Santona Tuli and Daniel Spiegel, Trinity University, San Antonio, TX 78212.* We perform forced Rayleigh scattering experiments and molecular dynamics simulations in order to investigate the temperature dependence of microscopic viscosity coefficients of methyl-red solutions in butanol and acetonitrile. We also examine the relationship between microscopic viscosity coefficient and coefficient of friction and compare viscosity coefficients on the microscopic and microscopic scales. Supported by Trinity University and Mach Research Fellowship.

<u>Group Photo Break</u> 2:55 – 3:00 PM - - - <u>PLEASE</u> assemble at the designated place !!!

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Session LM3B: 3:00 - 4:30 PM, Highland B - Sean Bentley, Adelphi Univ., Presider

LM3B1 - Thermoreflectance Imaging of Mid-IR Plasmonic Metamaterials. *Jessica Freese, Joshua A. Mason, and Janice Hudgings, Mount Holyoke College, South Hadley, MA 01075.* Thin-film, metamaterials with selective thermal absorption/emission resonances in the mid-infrared (mid-IR) wavelength range offer the potential for metamaterial 'wallpaper' for control of thermal signatures. Subwavelength thermoreflectance imaging offers the potential to directly image plasmonic absorption.

LM3B2 - Dynamics of Vertical-Cavity Surface-Emitting Lasers (VCSELs) with Selective Orthogonal Optical Feedback. *Taylor Gilfillan, Brenton Pope, and David W. Sukow, Washington and Lee University, Lexington, VA 24450.* Time-delayed orthogonal optical feedback can induce polarization self-modulation in a VCSEL. We characterize such dynamics experimentally, and report on observations of the dependence of square-wave stability on pump current and feedback strength. Supported by NSF and Washington and Lee University.

LM3B3 - Investigation of the Birefringence of Graded Refractive Index Materials. *Krysta A. Boccuzzi[1,2], Jianing Yao[1], and Jannick P. Rolland[1], 1) The Institute of Optics, University of Rochester, Rochester, NY 14627, 2) Rensselaer Polytechnic Institute, Troy, NY 12180.* We investigate the doubling seen in images of the film interfaces in gradient refractive index (GRIN) materials, taken using optical coherence tomography. The birefringence of the samples was measured, and it was determined that the birefringence is not the cause of the doubling. Future work will further investigate this observation. Supported by NSF.

LM3B4 - Charge Modulated Reflectance Spectroscopy on Organic Thin Film Transistors. *Lorelle Pye[1], Andrew Davis[2], Kenneth Carter[2], and Janice Hudgings[1], 1) Mount Holyoke College, South Hadley MA 01075. 2) University of Massachusetts, Department of Polymer Science and Engineering, Amherst MA 01003.* We explore the optical and electrical characteristics of organic thin film transistors using charge modulated reflectance spectroscopy. Spatial imaging of the active layer's reflectance profile is used to map the effects of electric fields and charge carriers in the conjugated polymer.

LM3B5 - Second Order Time Correlation Measurements of a Simulated Thermal Light Source. *Seth Berl and M.D. Havey, Department of Physics, Old Dominion University, Norfolk, VA 23529.* Rotation of a ground glass diffuser creates a time-dependent chaotic light field simulating a thermal light source. Second order time correlation $g^{(2)}(\tau) = 2$ for shorter times and $g^{(2)}(\tau) = 1$ for longer times. A similar approach to study $g^{(2)}(\tau)$ is planned for quasi one-dimensional Anderson Localization of light. Supported by NSF.

LM3B6 - Efficient Multiplexing and Demultiplexing of Light's Angular Momentum. *Nathan Brady[1,2], Thien An Nguyen[1], Giovanni Milione[1], Liubov Kreminska[2], and Robert R. Alfano[1], 1) Institute for Ultrafast Spectroscopy and Lasers, Physics Department, City College of New York, New York, NY 10031, 2) University of Nebraska Kearney, Kearney, NE 68849.* We present an efficient method to multiplex (combine) and demultiplex (separate) eigenstates of light's total angular momentum. Multiplexing is accomplished by dynamic generation of vector light fields using liquid crystal "q-plates." Demultiplexing is accomplished using a device that sorts light's total angular momentum analogous to a prism. Supported by NASA Nebraska Space Grant and ARO.

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Session LM4B: 4:45 – 6:00 PM, Highland B – Michael Noel, Bryn Mawr College, Presider

LM4B1 - Ag Doped Lanthanum Borogermanate Glasses, *Lindsay Mullenix[1], Thierry Cardinal[2], Evelyne Fargin[2], Helen Vigouroux[2],1) Clemson University, Clemson, SC 29634, 2) ICMCB, CNRS, Bordeaux University I, Pessac, France.* Glasses with the composition of 100-x [$25La_2O_3$-$25B_2O_3$-$50GeO_2$]+ xAg_2O, where x equals 0, .25, 1, and 2 (mol %) were fabricated, characterized using differential scanning calorimetry, and subjected to five separate heat treatments. Following each treatment system the samples were tested for transmission and luminescence. The addition of Ag was shown to lower the crystallization temperature. Supported by NSF through IREU.

LM4B2 – Creating Bessel Beams with a 4-f Spatial Filter. *Melia Bonomo[1,2], Martin G. Cohen [2], and John Noé [1], 1) Dickinson College, Carlisle, PA 17013, 2) Laser Teaching Center, Stony Brook University, Stony Brook, NY 11794.* We created Bessel-like (non-diffracting) beams by a recently described 4-f spatial filtering method (Kowalczyk, Smith, and Szarmes, AJP 2009), and studied their formation and evolution with a CCD camera and ImageJ software. Observed beams maintain a core diameter under 45 microns over a distance of 47 mm. Supported by Stony Brook Physics REU program.

LM4B3 - Investigation of the Application of Optical Coherence Tomography To Elastography. *Joseph V. Tocha[1,2], Kyesung Lee[1], Zaegyoo Hah[1],Kevin J. Parker[1],and Jannick P. Rolland[1,2], 1) The Institute of Optics, University of Rochester, Rochester, NY 14627, 2) University of Rochester Biomedical Engineering Program, Rochester NY 14627.* We investigate how optical coherence tomography (OCT) can be applied to elastography, a non-invasive method used to detect tumors. In this study we applied two mechanical shakers that produced crawling wave patterns within gelatin. In order to detect variations in the patterns, we collected data over an extended time period. Supported by NYSTAR Foundation.

LM4B4 - Alignment of the Hilbert Telescope for Use in an Undergraduate Laboratory. *Joyce Wu, Kyle Fuerschbach, Johan Thivollet, Kevin P. Thompson, and Jannick P. Rolland, University of Rochester, Rochester, NY 14627.* A telescope was designed and constructed for use in an undergraduate laboratory. It was designed specifically for demonstrating the emergence of multinodal aberrations in a controlled environment in which misalignment would be purposely introduced. Supported by NSF through REU.

LM4B5 - Optomechanical Rotational Sensor with Laguerre-Gaussian Beams. *Hao Shi and Mishkat Bhattacharya, Rochester Institute of Technology, Rochester, NY 14623*. We propose an optomechanical rotational sensor composed of an optically levitated dielectric coupled to Laguerre-Gaussian beams and derive the angular sensitivity using a set of quantum Langevin equations. Supported by Research Corporation for Science Advancement.

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Symposium organized by Harold Metcalf and John Noé, Stony Brook University