

Ariunbold GOMBOJAV, PhD.

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AREAS OF EXPERTISE:

- Ultrafast nonlinear optics
- Ultrafast laser spectroscopy
- Quantum optics
- Coherent anti-Stokes Raman spectroscopy

PROFESSIONAL EXPERIENCE:

Mississippi State University
Assistant Professor | August 2015 – present

Texas A&M University
Research Professor | 2013 – 2015

National University of Mongolia, Mongolia
Associate Professor | 2000 – 2002, 2013 – 2015

University of Arizona
Research Associate | 2011 – 2012

Texas A&M University
Research Associate | 2003, 2005 – 2006

Max-Planck Institute for Quantum Optics, Germany
Research Fellow | 2003 – 2004

EDUCATION:

2011 Ph.D. in Experimental Physics, Institute for Quantum Sciences & Engineering, Texas A&M University, USA

2000 Ph.D. in Theoretical Optics/Opto-Electronics, 2000, Palacky University, Czech Republic

PATENT:

Dmitry Pestov, Alexei V. Sokolov, Marlan O. Scully, Robert Murawski, **Ariunbold Gombojav**, Xi Wang, Vladimir Sautenkov, [*Hybrid technique for Coherent Anti-Stokes/Stokes Raman Spectroscopy.*](#)

PROFESSIONAL AFFILIATIONS & ACTIVITIES:

Member:

- American Physical Society (APS)
- Optical Society of America (OSA)

Reviewer:

- Optics Letters, Journal of Optics A, Physics Letters A, Journal of Physics A: Mathematical and Theoretical, Journal of Physics B: Atomic, Laser Physics Letters, Molecular & Optical Physics, and New Journal of Physics

HONORS & AWARDS:

- Herman F. Heep and Minnie Belle Heep Fellowship, 2010, 2011
- Alexander von Humboldt Research Fellowship, 2003, 2004
- Czech Government Scholarship, 1997-2000
- German Academic Exchange Service Scholarship, 2001
- Mongolian Academy of Sciences Award, 2002
- Best Young Lecturer Award, Department of Physics, National University of Mongolia, 2000

PUBLICATIONS

- **Gombojav O. Ariunbold** and Narangerel Altangerel, [Coherent anti-Stokes Raman spectroscopy: Understanding the essentials](#), Coherent Phenomena, review paper, in press.
- **Gombojav O. Ariunbold** and Narangerel Altangerel, [Quantitative interpretation of time-resolved coherent anti-Stokes Raman spectroscopy with all Gaussian pulses](#), Journal of Raman Spectroscopy, in press.
- Zhenhuan Yi, Pankaj K. Jha, Luqi Yuan, Dmitri V. Voronine, **Gombojav O. Ariunbold**, Alexander M. Sinyukov, Ziyun Di, Vladimir A. Sautenkov, Yuri V. Rostovtsev, and Alexei V. Sokolov, [Observing the transition from yoked superfluorescence to superradiance](#), Opt. Commun. **351**, 45 (2015).
- Dmitri V. Voronine, Alexander M. Sinyukov, Xia Hua, Elango Munusamy, **Gombojav O. Ariunbold**, Alexei V. Sokolov and Marlan O. Scully, [Complex Line Shapes in Surface-Enhanced Coherent Raman Spectroscopy](#), J. Mod. Opt., **62**, 90 (2015).
- Jonathan Thompson, Charles Ballmann, Han Cai, Zhenhuan Yi, Yuri Rostovtsev, Alexei Sokolov, Phil Hemmer, A. Zheltikov, and **Gombojav Ariunbold**, [Pulsed cooperative backward emissions from non-degenerate atomic transitions in sodium](#), New J. Phys. **16**, 103017 (2014).
- I.V. Fedotov, A.A. Voronin, N. Altangerel, S. Blakley, H. Perez, **G.O. Ariunbold** and A.M. Zheltikov, [All-fiber ultralow-energy soliton management at 1.55 micrometre](#), Laser Phys. Lett., **11**, 125801 (2014).
- Maik Scheller, Xi Chen, **Gombojav O. Ariunbold**, Norman Born, Jerome Moloney, Miroslav Kolesik, and Pavel Polynkin, [Raman conversion in intense femtosecond Bessel beams in air](#), Phys. Rev. A **89**, 053805 (2014).
- **Gombojav O. Ariunbold**, Vladimir A. Sautenkov, and Marlan O. Scully, [Ultrafast laser control of backward superfluorescence towards standoff sensing](#), Appl. Phys. Lett. **104**, 021114 (2014).
- **Gombojav O. Ariunbold**, Vladimir A. Sautenkov, and Marlan O. Scully, [Temporal coherent control of superfluorescent pulses](#), Opt. Lett., **37**, 2400, (2012).
- Luqi Yuan, Dmitry Pestov, Robert K. Murawski, **Gombojav O. Ariunbold**, MiaoChan Zhi, Xi Wang, Vladimir A. Sautenkov, Yuri V. Rostovtsev, Torsten Siebert and Alexei V. Sokolov, [Tracking of Molecular Wave-Packets in Cesium Dimers using Coherent Raman Scattering](#), **86**, 023421, Phys. Rev. A (2012).
- **Gombojav O. Ariunbold**, Pavel Polynkin and Jerome V. Moloney, [Third and fifth harmonic generation by tightly focused femtosecond pulses at 2.2 \$\mu\text{m}\$ wavelength in air](#) Opt. Express, **20**, 1662 (2012).
- **Gombojav O. Ariunbold**, Wenlong Yang, Alexei V. Sokolov, Vladimir A. Sautenkov, and Marlan O. Scully, [Superradiance in a Three-Photon Resonant Medium](#), **85**, 023424, Phys. Rev. A (2012).
- **Gombojav O. Ariunbold**, Vladimir A. Sautenkov, and Marlan O. Scully, [Quantum fluctuations of superfluorescence delay observed with ultrashort optical excitations](#), Phys. Lett. A, **376**, 335 (2012).
- **Gombojav O. Ariunbold**, Michael M. Kash, Vladimir A. Sautenkov, Hebin Li, Yuri V. Rostovtsev, George R. Welch, and Marlan O. Scully, [Picosecond UV pulses Produced by Coherent Scattering of IR Femtosecond Pulses](#), JOSA B, **28**, 515 (2011).
- **Gombojav O. Ariunbold**, Vladimir A. Sautenkov, and Marlan O. Scully, [A Switching from a Sequential Transition to Quantum Beating in Atomic Rubidium Pumped by a Femtosecond Laser](#), JOSA B, **28**, 462 (2011).
- **Gombojav O. Ariunbold**, Michael M. Kash, Vladimir A. Sautenkov, Hebin Li, Yuri V. Rostovtsev, George R. Welch, and Marlan O. Scully, [Observation of Picosecond Superfluorescent Pulses in Rubidium Vapor Pumped by 100-Femtosecond Laser Pulses](#), Phys. Rev. A, **82**, 043421 (2010).
- Luqi Yuan, **Gombojav O. Ariunbold**, Robert K. Murawski, Dmitry Pestov, Xi Wang, Vladimir A. Sautenkov, Alexei V. Sokolov, Yuri V. Rostovtsev and Marlan O. Scully, [Femtosecond Wave-Packet Dynamics in Cesium Dimers Studied through Controlled Stimulated Emission](#), Phys. Rev. A **81**, 053405 (2010).
- **Gombojav O. Ariunbold**, Yuri V. Rostovtsev, Vladimir A. Sautenkov and M.O. Scully, [Intensity correlations and anticorrelations in coherently driven atoms](#), Special issue: Festschrift in Memory of Lorenzo M. Narducci, J. Mod. Opt. **57** 1417 (2010).
- Lucas M. Naveira, Benjamin D. Strycker, Jieyu Wang, **Gombojav O. Ariunbold**, Alexei V. Sokolov, and George W. Kattawar, [Propagation of femtosecond laser pulses through water in the linear absorption regime](#), App. Opt. **48** 1828 (2009).
- **Gombojav O. Ariunbold**, Michael M. Kash, Hebin Li, Vladimir A. Sautenkov, Yuri V. Rostovtsev, George R. Welch and Marlan O. Scully, [A model experiment for Stand-Off Sensing](#), J. Mod. Opt. **55**, 3273 (2008)

- Tigran S. Varzhapetyan, Hebin Li, **Gombojav O. Ariunbold**, Vladimir A. Sautenkov, Yuri V. Rostevtsev and Marlan O. Scully, [Intensity correlations in a coherently prepared Rb vapor in a magnetic field](#), Opt. Commun. 282, 39 (2008).
- D. Pestov, Xi Wang, R. K. Murawski, **G. O. Ariunbold**, V. A. Sautenkov, and A. V. Sokolov, [Pulse shaping for mode-selective ultrafast coherent Raman spectroscopy of highly scattering solids](#), J. Opt. Soc. Am. B, 25, 768 (2008).
- D. Pestov, X. Wang, **G. O. Ariunbold**, R. K. Murawski, V. A. Sautenkov, A. Dogariu, A. V. Sokolov, and M. O. Scully, [Single-shot Detection of Bacterial Endospores via Coherent Raman Spectroscopy](#), Proc. Natl. Acad. Sci. U.S.A. 105, 422 (2007).
- D. Pestov, **G. O. Ariunbold**, X. Wang, R. K. Murawski, V. A. Sautenkov, A. V. Sokolov, and M. O. Scully, [Coherent versus incoherent Raman scattering: molecular coherence excitation and measurement](#), Optics Letters 32 (2007), pp. 1725-1727. [selected for the August 2007 issue of Virtual Journal of Ultrafast Science]
- D. Pestov, R. K. Murawski, **G. O. Ariunbold**, X. Wang, M. Zhi, A. V. Sokolov, V. A. Sautenkov, Y. V. Rostovtsev, A. Dogariu, Y. Huang, and M. O. Scully, [Optimizing the Laser-Pulse Configuration for Coherent Raman Spectroscopy](#), Science 316 (2007), pp. 265-268. [Highlights on photonics spectra], [Princeton University news], [Science Daily], [A perspective given by Dr. Robert Lucht in SCIENCE Magazine]
- **G.O. Ariunbold**, G.S. Agarwal, Z. Wang, M.O. Scully and H. Walther: [Nanosecond Dynamics of Single-Molecule Fluorescence Resonance Energy Transfer](#) Phys. Chem. A, 108, 2402 (2004).
- G.S. Agarwal, **G.O. Ariunbold**, J. von Zanthier and H. Walther: [Nonclassical Imaging for a Quantum Search of Trapped Ions](#) Phys. Rev. A, 70, 063816 (2004). [selected for the January 2005, Vol. 5, 1 issue of Virtual Journal of Quantum Information]
- **G. Ariunbold** and J. Perina: [Nonclassical behavior and switching in Kerr nonlinear couplers](#), J.Mod.Opt. 48, 1005, (2001).
- **G. Ariunbold** and J. Perina: [Quantum statistical properties of contradirectional Kerr couplers](#), Opt. Commun. 176, 149 (2000).
- **G. Ariunbold**, J. Perina and Ts. Gantsog: [Pair-atomic effects in the micromaser](#), Acta Phys. Slov. 50, 507 (2000).
- **G. Ariunbold**, J. Perina, Ts. Gantsog and F.A.A. El-Orany: [Two-mode correlated states in cavity with injected atoms](#) Acta Phys. Slov. 49, 627 (1999).
- **G. Ariunbold**, J. Perina and Ts. Gantsog: [Nonclassical states in cavity with injected atoms](#), J. Opt. B: Quantum Semiclass. Opt. 1, 219 (1999).
- **G. Ariunbold**, J. Perina and Ts. Gantsog: [Holstein-Primakoff SU\(1,1\) coherent state in the micromaser under intensity dependent Jaynes-Cummings interactions](#), Special Issue on Quantum Optics and Quantum Information, Acta Phys. Slov. 48, 315 (1998).

PHD THESES:

- **Ariunbold Gombojav**, [“Ultrafast Cooperative Phenomena in Coherently Prepared Media: From Superfluorescence to Coherent Raman Scattering and Applications”](#); Texas A&M University, USA (2011).
- **Gombojav Ariunbold**, [“Interactions of Matter with Nonclassical Light”](#); Palacky University, Czech Republic (2000).

PROCEEDINGS WITH REVIEW COMMITTEE:

- Narangerel Altangerel, **Gombojav Ariunbold**, Connor Gorman, Dwight Bohlmeier, Joshua Yuan, Philip Hemmer, and Marlan O. Scully, [Early, in vivo, Detection of Abiotic Plant Stress Responses via Raman Spectroscopy](#), CLEO, 2016.
- Narangerel Altangerel, **Gombojav Ariunbold**, Zhenhuan Yi, Tuguldur Begzjav, Esther Ocola, Jaan Laane, and Marlan O. Scully, [Coherent Stokes Raman Spectroscopy of Pyridine in Gas-Phase at Low Temperature](#), CLEO, 2016.
- **Gombojav O. Ariunbold**, Vladimir A. Sautenkov and Marlan O. Scully, [A Rapid Inspection of Quantum Interference using Superfluorescent Picosecond Pulses](#), CLEO 2010.
- Alexei V. Sokolov, **Gombojav O. Ariunbold**, Xi Wang and Marlan O. Scully, [Controlling Directionality of Mirror-less Lasing by Pulse Shaping and Timing](#), CLEO/QELS 2010.

- **G. O. Ariunbold**, M. M. Kash, H. Li, V. Sautenkov, Y. Rostovtsev, G. R. Welch, and M. O. Scully, [*A Model Experiment for Stand-off Sensing*](#), in *Frontiers in Optics*, OSA Technical Digest (CD) (Optical Society of America, 2008), paper FThO6, October 19, 2008, Rochester, NY.
- Dmitry Pestov, **Gombojav Ariunbold**, Xi Wang, Robert K. Murawski, Vladimir A. Sautenkov, Yuri V. Rostovtsev, Anil Patnaik, Alexei V. Sokolov and Marlan O. Scully, [*Monitoring Vibrational Wave Packet Dynamics via Direct Femtosecond Pump-Probe Measurements*](#), Tech. Dig., Conf. on Lasers and Electro-Optics and Quantum Electronics and Laser Science Conf. (CLEO/QELS), May 2007, Baltimore, MD.
- Dmitry Pestov, Robert K. Murawski, **Gombojav Ariunbold**, Xi Wang, MiaoChan Zhi, Alexei V. Sokolov, Vladimir A. Sautenkov, Yuri V. Rostovtsev, and Marlan O. Scully, [*Hybrid of Frequency and Time Resolved CARS*](#), Tech. Dig., Conf. on Lasers and Electro-Optics and Quantum Electronics and Laser Science Conf. (CLEO/QELS), May 2007, Baltimore, MD.
- Dmitry Pestov, Robert K. Murawski, **Gombojav Ariunbold**, Xi Wang, MiaoChan Zhi, Alexei V. Sokolov, Vladimir A. Sautenkov, Yuri V. Rostovtsev, and Marlan O. Scully, [*Detection of B. subtilis spores via Hybrid CARS*](#), Tech. Dig., Conf. on Lasers and Electro-Optics and Quantum Electronics and Laser Science Conf. (CLEO/QELS), May 2007, Baltimore, MD.
- Vladimir A. Sautenkov, **Gombojav O. Ariunbold**, Yuri V. Rostovtsev, Marlan O. Scully, [*From EIT photon correlations to Raman anti-correlations in coherently prepared Rb vapor*](#), Tech. Dig., Conf. on Lasers and Electro-Optics and Quantum Electronics and Laser Science Conf. (CLEO/QELS), May 2006, Long Beach, CA.
- **G. Ariunbold**, J. Perina and Ts. Gantsog: [*Nonclassical states in micromaser under the unified Jaynes-Cummings interactions*](#), Proceedings: Sixth International Conference on Squeezed States and Uncertainty Relations, NASA, p84, 2000.

SELECTED PRESENTATIONS

- Presenter, Conference on Lasers and Electro-Optics and Quantum Electronics and Laser Science (CLEO/QELS), San Jose, CA, 2010, 2016
- Invited speaker, prof. M. Cicerone's group meeting, NIST, MD, September 18, 2015
- Presenter, 36, 38, 39, 40, 44 and 45th Winter Colloquiums on the Physics of Quantum Electronics, Snowbird, Utah, 2006, 2008, 2009, 2010, 2014 and 2015
- Presenter, Summer School on Quantum Optics, Casper/Jackson Hole, Wyoming, 2005, 2007, 2009, 2010, 2013, 2014 and 2015
- Invited speaker, Remote Atmospheric Magnetometry Workshop, Arlington, Virginia, April 25-26, 2014
- Invited speaker, Second Princeton Workshop on Classical, Semi-classical and Quantum Noise, Princeton University, March 21-23, 2014
- Invited speaker, 4th International Meeting on Frontiers of Physics, Pahang, Malaysia, August 27- 30, 2013
- Invited speaker, "Quantum Thermodynamics: Increasing Quantum Heat Engine Efficiency via Quantum Coherence", Frontiers of Quantum and Mesoscopic Thermodynamics Conference, Prague, Czech Republic, July 29 - August 3, 2013
- Invited speaker, "Coherence Brightening: From Coherent Raman Spectroscopy to Superradiance", Department of Optics, Palacky University and Quantum Optics Laboratory, Olomouc, Czech Republic, July 31, 2013
- Invited speaker, "Advanced Technology and Optical Sciences in Everyday Life", NUMOSA student chapter, National University of Mongolia, Mongolia, April 18, 2013
- Invited speaker, "Hybrid CARS: New technology in nonlinear laser spectroscopy", School of Physics and Electronics, National University of Mongolia, Mongolia, February 20, 2013
- Invited speaker, Air Force of Science Research: Non-Linear Optics Meeting, Albuquerque, New Mexico, October 18-20, 2011
- Presenter, Symposium on Bose Einstein Condensations, Princeton, New Jersey, October 14-15, 2005
- Invited speaker, National University of Mongolia, Ulaanbaatar, Mongolia, December 14, 2004
- Invited speaker, prof. A. Zeilinger's group meeting, University of Vienna, Vienna, Austria, November 15, 2004
- Invited speaker, prof. K. Bergmann's group meeting, University of Kaiserslautern, Kaiserslautern, Germany, October 8, 2004
- Invited speaker, prof. W. Schleich's group meeting, University of Ulm, Ulm, Germany, September 22, 2004.

- Invited speaker, prof. G. Leuchs' group meeting, Max Planck Institute for the Science of Light, Erlangen, Germany, July 31, 2004
- Invited speaker, prof. I. Cirac's group meeting, Max-Planck Institute of Quantum Optics, Munich, Germany, May 19, 2004
- Invited speaker, Annual Meeting of the German Physical Society, Munich, Germany, March 22-26, 2004