

# PiNG 2017

## Conference on Polarization in Noble Gases

OCTOBER 8 – 13, 2017  
PARK CITY, UTAH, USA



- Basics of Optical Pumping (MEOP & SEOP)
- Polarization hardware, lasers, new techniques
- MR Imaging with hyperpolarized gases
- Magnetometry
- $^3\text{He}$  Neutron Spin Filters
- Porous Media/Surface Science
- Fundamental Symmetries Tests
- $^{129}\text{Xe}$  Biosensors

### INVITED SPEAKERS:

- Mitchell Albert *Thunder Bay RRI*
- Talissa A. Altes *University of Missouri*
- Gordon D. Cates *University of Virginia*
- Wangchun Chen *NIST-Gaithersburg*
- Boyd Goodson *Southern Illinois University*
- G. Wilson Miller *University of Virginia*
- Graham Norquay *University of Sheffield*
- Pierre-Jean Nacher *LKB-Paris*
- W. Michael Snow, *Indiana University*
- Thad G. Walker *University of Wisconsin*
- Anatoli Zelenski *Brookhaven Nat'l Lab*

<http://www.physics.utah.edu/ping>

### Corporate Sponsors



# PiNG 2017 PROGRAM

## SUNDAY, OCT. 8<sup>th</sup> – EVENING

18:00 – 21:00 WELCOME RECEPTION (The Cabin I)

## MONDAY, OCT. 9<sup>th</sup> – MORNING

8:30 – 8:45 WELCOME and ORIENTATION (Brian Saam)

8:45 – 9:45 SESSION A: MEOP TUTORIAL (Pierre-Jean Nacher)

9:45 – 10:30 COFFEE BREAK

10:30 – 11:45 SESSION B: MEOP METHODS

### INVITED ORAL PRESENTATIONS

10:30 – 11:00 **B1.** Anatoli Zelenski, *Polarized  $^3\text{He}^{++}$  Ion Source Development at RHIC*

### CONTRIBUTED ORAL PRESENTATIONS

11:00 – 11:20 **B2.** Austin Reid, *Development of a  $^3\text{He}$  MEOP Polarization Source for nEDM Systematic Studies Apparatus*

11:20 – 11:40 **B3.** Matthew Musgrave, *Polarimetry and Gas Injection Studies for the Polarized  $^3\text{He}^{++}$  Ion Source at RHIC*

11:45 – 13:15 LUNCH (provided at conference site)

## MONDAY, OCT. 9<sup>th</sup> – AFTERNOON

13:15 – 14:00 SESSION C: MRI TUTORIAL (Jim Wild)

14:00 – 14:15 BREAK

14:15 – 16:15

SESSION D: LUNG MRI

INVITED ORAL PRESENTATIONS

14:15 – 14:45

**D1.** Talissa Altes *Developments in Lung MRI with Hyperpolarized  $^3\text{He}$*

CONTRIBUTED ORAL PRESENTATIONS

14:45 – 15:05

**D2.** Robert V. Cadman, *MRI Measure of Small Airways Dimensions in the Asthmatic Lung*

15:05 – 15:25

**D3.** Bastiaan Driehuys, *Imaging Pulmonary Gas Exchange using  $^{129}\text{Xe}$  MRI: The Transition to 3 Tesla*

15:25 – 15:45

**D4.** Nara S. Higano, *Hyperpolarized  $^3\text{He}$  Restricted Diffusion MRI in Ex-Vivo Infant Lungs: Alveolar-Airspace Size*

15:45 – 16:30

COFFEE BREAK

16:30 – 18:00

SESSION E: FRONTIERS/EXOTICA

INVITED ORAL PRESENTATIONS

16:30 – 17:00

**E1.** G. Wilson Miller, *Polarized Nuclear Imaging: A Novel Approach for Imaging and Spectroscopy of Radioactive Nuclei*

CONTRIBUTED ORAL PRESENTATIONS

17:00 – 17:20

**E2.** Christopher P. Bidinosti, *Into the Wild: Unconventional NMR Trajectories on the Bloch Sphere at Low Field*

17:20 – 17:40

**E3.** Anatoli Zelenski, *High-Intensity Optically-Pumped Polarized H-Ion Source for the RHIC Spin Physics*

TUESDAY, OCT. 10<sup>th</sup> – MORNING

8:45 – 9:45

SESSION F: SEOP TUTORIAL (Thad G. Walker)

9:45 – 10:30

COFFEE BREAK

10:30 – 11:50           SESSION G: SEOP METHODS I

INVITED ORAL PRESENTATIONS

10:30 – 11:00           **G1.** Boyd M. Goodson, *Hyperpolarization of  $^{129}\text{Xe}$  and  $^{131}\text{Xe}$  by Clinical-Scale Stopped-Flow Spin-Exchange Optical Pumping*

11:00 – 11:30           **G2.** Graham Norquay, *Rapid Production of Highly Polarized Xenon-129 for Clinical MR Imaging*

CONTRIBUTED ORAL PRESENTATIONS

11:30 – 11:50           **G3.** Benjamin Niederlander, *Method for fast, efficient and continuous application of hyperpolarized  $^{129}\text{Xe}$  in aqueous and biocompatible liquids*

11:50 – 14:00           LUNCH (on own)

TUESDAY, OCT. 10<sup>th</sup> – AFTERNOON

14:00 – 15:00           SESSION H: SEOP METHODS II

CONTRIBUTED ORAL PRESENTATIONS

14:00 – 14:20           **H1.** Alexandr Ryasnyanskiy, *Narrow-line high power hybrid laser system for simultaneous pumping of Cesium and Rubidium atoms*

14:20 – 14:40           **H1.** Steven Anderson, *Hyperpolarized Helium-3 gas Production and Delivery for use in Lungs of Pediatric Subjects*

14:40 – 15:00           **H3.** Kai Jin, *Progress of polarized  $^3\text{He}$  target upgrade at JLab*

15:00 – 15:15           BREAK

15:15 – 16:15           POSTER PREVIEW SESSION I

16:15 – 18:00           POSTER SESSION I

## WEDNESDAY, OCT. 11<sup>th</sup> – MORNING

8:45 – 9:45

### SESSION I: MAGNETOMETRY

#### INVITED ORAL PRESENTATIONS

8:45 – 9:15

**I1.** John E. Kitching, *A microfabricated source of hyperpolarized Xe atoms*

#### CONTRIBUTED ORAL PRESENTATIONS

9:15 – 9:35

**I2.** Daniel Thrasher, *Towards a Primary Quantum Rotation Standard: Co-Magnetometry with Transversely Polarized Xe*

9:35 – 9:55

**I3.** Andreas Maul, *<sup>3</sup>He Magnetometer for Precision Measurement of High Magnetic Field*

9:55 – 10:15

**I4.** Skyler Degenkolb, *Multiphoton Transitions and Polarized Nuclei: Progress towards Optical Magnetometry using Ground State Noble Gases*

10:15 – 11:00

### COFFEE BREAK

11:00 – 12:45

### SESSION J: HyperCEST/BIOSENSORS

#### INVITED ORAL PRESENTATIONS

11:00 – 11:30

**J1.** Leif Schroeder, *Efficient and Versatile Depolarization Hosts for Xenon Hyper-CEST Applications*

11:30 – 12:00

**J2.** Mitchell Albert, *Medical Applications of Hyperpolarized Noble Gases Including In Vivo HyperCEST Detection*

#### CONTRIBUTED ORAL PRESENTATIONS

12:00 – 12:20

**J3.** Lorenz Mitschang, *A comprehensive Hyper-CEST model: tracking the detection limit and absolute quantification*

12:20 – 12:40

**J4.** Serge D. Zemerov, *Two Genetically Encoded Contrast Agents for Ultrasensitive <sup>129</sup>Xe NMR*

## WEDNESDAY, OCT. 11<sup>th</sup> – AFTERNOON

Free for hiking and excursions to Old Town Park City.

## THURSDAY, OCT. 12<sup>th</sup> – MORNING

- 8:45 – 9:45           SESSION K: NEUTRON PHYSICS TUTORIAL  
(Earl Babcock and Thomas R. Gentile)
- 9:45 – 10:30           COFFEE BREAK
- 10:30 – 11:40           SESSION L: NEUTRON PHYSICS
- INVITED ORAL PRESENTATIONS
- 10:30 – 11:00           L1. Wangchun Chen, *Centralized <sup>3</sup>He SEOP Systems for Neutron Spin Filter Applications at NIST*
- CONTRIBUTED ORAL PRESENTATIONS
- 11:00 – 11:20           L2. Takashi Ino, *<sup>3</sup>He Neutron Spin Filter for Polarized Neutron Spectrometer POLANO at J-PARC*
- 11:20 – 11:40           L3. Tianho Wang, *Development of In-Situ Spin Exchange Optical Pumping (SEOP) <sup>3</sup>He system for Polarized Neutron Applications at ORNL*
- 11:45 – 13:45           LUNCH (on own)

## THURSDAY, OCT. 12<sup>th</sup> – AFTERNOON

- 13:45 – 15:45           SESSION M: EDM Searches
- INVITED ORAL PRESENTATIONS
- 13:45 – 14:15           M1. Lutz Trahms, *Precision of Precession – Polarized Noble Gas Nuclei in the ultra-low field of BMSR2*
- CONTRIBUTED ORAL PRESENTATIONS
- 14:15 – 14:35           M2. Stefan Zimmer, *Search for a Permanent Electric Dipole Moment of <sup>129</sup>Xe with a <sup>3</sup>He/<sup>129</sup>Xe Clock-Comparison Experiment*
- 14:35 – 14:55           M3. Emily Altiere, *High Resolution Two Photon Spectroscopy of the 6p←5p transition of Xenon at 252 nm*
- 14:55 – 15:15           M4. Florian Kuchler, *A new Search for an Electric Dipole Moment of <sup>129</sup>Xe at FRM-II and PTB Berlin*

15:15 - 15:30

BREAK

15:30 - 16:30

POSTER PREVIEW SESSION II

16:30 - 18:00

POSTER SESSION II

19:00 - 22:00

CONFERENCE BANQUET  
(Speaker: Gordon D. Cates)

## FRIDAY, OCT. 13<sup>th</sup> – MORNING

8:45 – 10:15 AM      SESSION N: BRAIN & TISSUE MRI

### CONTRIBUTED ORAL PRESENTATIONS

8:45 – 9:15 AM      **N1.** Alanna Wade, *Hyperpolarized  $^{129}\text{Xe}$  Functional Magnetic Resonance Imaging (fMRI) of the Brain in Healthy Volunteers*

9:15 – 9:35 AM      **N2.** Rosa T. Branca, *Detection of Brown Adipose Tissue Thermogenesis in Humans by Hyperpolarized Xenon MRI*

9:35 – 9:55 AM      **N3.** Madhwesha Rao, *Imaging the ischemic region of human brain with intracranial arterial stenosis using hyperpolarized  $^{129}\text{Xe}$  magnetic resonance imaging*

9:55 – 10:15 AM      **N4.** Francis T. Hane, *In vivo Detection of Impaired Cerebral Perfusion in the Human Brain in Alzheimer's Disease Using Hyperpolarized  $^{129}\text{Xe}$  MRI*

10:15 – 10:30 AM      BREAK

10:30 – 12:00      SESSION O: PHYSICS BEYOND THE STANDARD MODEL

### INVITED ORAL PRESENTATIONS

10:30 – 11:00      **O1.** W. Michael Snow, *Beyond Standard Model Physics Using Polarized Noble Gases*

### CONTRIBUTED ORAL PRESENTATIONS

11:00 – 11:20      **O2.** Josh Abney, *Gyromagnetic Faraday Rotation of Polarized  $^3\text{He}$*

11:20 – 11:40      **O3.** Changbo Fu, *Experimentally Searching for New Spin-and-Velocity-Dependent Interactions with  $\text{SmCo}_5$  Spin Sources and a SERF Magnetometer*

11:45 – 12:00      CLOSING



## Posters Presented Tuesday October 10

- Boisvert, et al. "Dielectric barrier discharges..."
- Irwin, et al. "Using in situ rotational Raman spectroscopy..."
- Jiang, et al. "Off-situ  $^3\text{He}$  polarization under simultaneous pumping of K and Rb atoms"
- Schrank and Driehuys "A Device to Provide a Uniform, Temperature-Independent..."
- Schrank and Driehuys "Computational Fluid Dynamic Analysis..."
- Arthofer, et al. "Consistent Quality Assessment in Hyperpolarized Lung MRI"
- Plata, et al. "Detection of a Cucurbit[6]uril Biosensor in an Animal Model using Hyperpolarized Xenon MRI"
- Antonacci, et al. "Establishing an Absolute Reference for Dissolved-phase  $^{129}\text{Xe}$  Chemical Shifts"
- Babcock, et al. "SEOP Based Neutron Polarization Solutions for the JCNS"
- Burant, et al. "Effects of Diffusion on the Longitudinal and Transverse Relaxation..."
- Fan, et al. "Precision measurements of the ratio of gyromagnetic ratios in He/Xe gas mixture"

## Posters Presented Thursday October 12

- Claustre, et al. "Advanced Collisional Radiative Model..."
- Lang, et al. "Development of a Low-Pressure  $^{129}\text{Xe}$  Purification System..."
- Palasz, et al. "Hyperpolarization of  $^3\text{He}$  and  $^{129}\text{Xe}$  Gases for Medical Applications"
- Zheng, G. "A SEOP Filling Station at the Monash Biomedical Imaging Centre"
- Kilian, et al. "Completely Passive Up-Concentration..."
- Collier, et al. "Rapid Acquisition of Hyperpolarized  $^{129}\text{Xe}$ ..."
- Hassan, et al. "Optimization and Characterization of a Magnetostatic Cavity..."
- Prete, et al. "HyperCEST Detection of Cyclodextrin-Based Pseudorotaxanes..."
- Zou, et al. "Ultra-sensitive potassium magnetometer..."
- Terrano, et al. "Frequency shifts in noble-gas magnetometers..."