

PROGRAM AND REGISTRATION

42nd International Symposium on Ultrasonic Imaging and Tissue Characterization

June 5 – 7, 2017
Westin Arlington Gateway
Arlington, VA

The annual International Symposium on Ultrasonic Imaging and Tissue Characterization has long been recognized as one of the world's leading forums concerned with ultrasonic technology for medical applications. Fifty-nine technical contributions will be presented this year. Many of the presentations will deal with clinical evaluation of novel methodologies and instrumentation for tissue characterization.

The program includes technical sessions on tissue elasticity, therapy response, photoacoustics, tissue parameters, imaging and robot-assisted imaging/guidance. In a special session to be held during part of the Monday lunch break, NIH representatives will respond to questions regarding research-funding opportunities in the face of budget constraints at NIH.

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Riverside Research, New York

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PROGRAM

MONDAY, JUNE 5

- 7:00 a.m. **Registration/Coffee and Pastry**
- 8:00 a.m. **Welcome**
Ernest J. Feleppa, *Symposium Chairman*
- 8:05 a.m. **1. TISSUE PARAMETERS 1**
Chmn: Timothy J. Hall, *U. Wisconsin - Madison*
- 1.1 **Preliminary assessment of cervical remodeling during pregnancy with speckle statistics: comparison between early and late pregnancy**, Ivan M. Rosado-Mendez, Andrew Santoso, Quinton Guerrero, Lindsey Drehfal, Helen Feltovich, and Timothy Hall, *U. Wisconsin - Madison*
- 8:20 a.m.
- 1.2 **Quantitative ultrasound anisotropy of *in-vivo* uterine cervix: early vs. late stage pregnancy**, Quinton W. Guerrero, Lindsey C. Drehfal, Andrew Santoso, Ivan Rosado-Mendez, Helen Feltovich and Timothy J. Hall, *U. Wisconsin - Madison and Intermountain Healthcare*
- 8:35 a.m.
- 1.3 **Assessment of cervical softening during pregnancy in the Rhesus macaque using shear-wave speed: comparison of transabdominal vs. intracavitary approaches**, Lindsey C. Drehfal, Ivan M. Rosado-Mendez, Mark L. Palmeri, Andrew Santoso, Quinton Guerrero, Helen Feltovich and Timothy Hall, *U. Wisconsin - Madison, Duke U. and Intermountain Healthcare*
- 8:50 a.m.
- 1.4 **Cross-sectional study of backscatter-based quantitative ultrasound to assess cervical remodeling**, Andrew P.

Santoso, Ivan M. Rosado-Mendez, Quinton W. Guerrero, Lindsey C. Drehfal, Helen Feltovich, and Timothy J. Hall, *U. Wisconsin - Madison and Intermountain Healthcare*

9:05 a.m.

1.5 Multi-QUS biomarker approach to evaluation of pregnant cervix: summary of findings and implications for future research, Helen Feltovich, Ivan M. Rosado-Mendez, Lindsey Drehfal, Quinton Guerrero, Andrew Santoso, Mark Palmeri, William Grobman and Timothy Hall, *U. Wisconsin - Madison, Intermountain Healthcare and Northwestern U.*

9:20 a.m.

1.6 Compressive sensing for quantitative acoustic microscopy images using approximate message passing, J-H Kim, A. Basarab, P.R. Hill, N.Canagarajah, D. Kouamé, J. Mamou and A. Achim, *U. Bristol, U. Toulouse, CNRS, INPT, UPS, UTIC, UT2J and Riverside Research*

9:35 a.m. **Coffee**

10:20 a.m. **2. IMAGING 1**

Chmn: Brett Byram, *Vanderbilt U.*

2.1 Principal component short-lag spatial coherence imaging (PC-SLSC), Arun Asokan Nair, Trac D. Tran and Muiyinat A. Lediju Bell, *Johns Hopkins U.*

10:35 a.m.

2.2 Spatial coherence as a predictor of image quality, Will Long and Gregg E. Trahey, *Duke U.*

10:50 a.m.

2.3 Assessment of ADMIRE in presence of random noise and limitations of conventional Hilbert-transform envelope detection with decluttered signals, Kazuyuki Dei and Brett Byram, *Vanderbilt U.*

11:05 a.m.

2.4 Beamforming using nonlinear transfer functions, Adam Luchies and Brett Byram, *Vanderbilt U.*

11:20 a.m.

2.5 Nonlinear beamforming methods for imaging large calcifications, Jaime Tierney, Siegfried Schlunk, Mark George, Pranav Karve, Ravindra Duddu, Ryan Hsi and Brett Byram, *Vanderbilt U.*

11:35 a.m.

2.6 Beamforming challenges in swept synthetic-aperture imaging, Matthew R. Morgan, Nick Bottenus and Gregg E. Trahey, *Duke U.*

11:50 a.m. **Lunch**

11:50 a.m. – 12:30 p.m. **Lunch-Break Discussion**

NIH PROGRAM FUNDING

Houston Baker, *NCI*; Chiayeng Wang, *CSR and NIDCR*; and James G. Miller, *Washington U. in St. Louis* (Moderator)

2:00 p.m. **3. THERAPY RESPONSE**

Chmn: Gregory J. Czarnota, *U. Toronto*

3.1 Computer-assisted technology for assessment of therapeutic cancer responses in patients with locally-advanced breast cancer, Mehrdad J. Gangeh, Lakshmanan Sanachi, William T. Tran and Gregory J. Czarnota, *U. Toronto and Sunnybrook HSC*

2:15 p.m.

3.2 Response monitoring of breast-cancer patients receiving neoadjuvant chemotherapy using quantitative ultrasound, texture and molecular features, Lakshmanan Sannachi, Hadi Tadayyon, Mehrdad Gange, Ali Sadeghi-Naini, William Tran, Sonal Gandhi, Frances Wright, and Gregory Czarnota, *Sunnybrook HSC and U. Toronto*

2:30 p.m.

3.3 Quantitative ultrasound and texture predictors of breast tumor response to chemotherapy prior to treatment: progress update, Gregory Czarnota, Hadi Tadayyon, Mehrdad Gangeh, Lakshmanan Sannachi, Ali Sadeghi-Naini, William Tyler Tran, Sonal Gandhi and Maureen Trudeau, *U. Toronto and Sunnybrook HSC*

2:45 p.m.

3.4 Predicting radiotherapy response in head and neck patients using quantitative ultrasound: initial results, William T. Tran, Harini Suraweera, Mehrdad Gangeh, Justin Lee, Irene Karam, Lakshmanan Sannachi, Elyse Watkins, Karina Quiaoit and Gregory J. Czarnota, *Sunnybrook HSC and U. Toronto*

3:00 p.m.

3.5 Novel ultrasound imaging method for 2D temperature monitoring of thermal ablation, Chloé Audigier, Younsu Kim and Emad M. Boctor, *Johns Hopkins U.*

3:15 p.m.

3.6 HIFU ablation monitoring using active ultrasound elements: feasibility study, Yoonsu Kim, Chloe Audigier, Austin Dillow and Emad M. Boctor, *Johns Hopkins U.*

3:30 p.m. **Coffee**

4:15 p.m. **4. ROBOT-ASSISTED IMAGING/TRACKING**

Chmn: Emad M. Boctor, *Johns Hopkins U.*

4.1 **Photoacoustic-based visual servoing of needle tips to improve surgery on obese patients**, Joshua Shubert and Muyinatu Bell, *Johns Hopkins U.*

4:30 p.m.

4.2 **In-vivo catheter tracking using photoacoustics**, Alexis Cheng, Younsu Kim, Clifford Weiss, Russell H. Taylor and Emad M. Boctor, *Johns Hopkins U.*

4:45 p.m.

4.3 **Incorporation of ultrasound imaging into assistive devices for inferring motor intent and proportional control**, Siddhartha Sikdar, Elizabeth Tarbox, Ananya Dhawan, Nima Akhlaghi, Clayton Alex Baker, Parag Chitnis and Paul Gammell, *George Mason U.*

5:00 p.m.

4.4 **Cooperatively-controlled three-dimensional robotic synthetic tracked-aperture ultrasound imaging**, Haichong K. Zhang, Ting Yun Fang, Rodolfo Finocch and Emad M. Boctor, *Johns Hopkins U.*

5:15 p.m. **Adjourn**

TUESDAY, JUNE 6

7:00 a.m. **Coffee and Pastry**

8:00 a.m. **5. TISSUE PARAMETERS 2**

Chmn: Ernest J. Feleppa, *Riverside Research*

5.1 **Local sound-speed estimator by means of a model-based approach**, Marko Jakovljevic, Rehman Ali, Scott Hsieh and Jeremy J. Dahl, *Stanford U.*

8:15 a.m.

5.2 **Extended nearly-local Kramers-Kronig approximation for ultrasonic tissue characterization in soft and hard tissue**, James G. Miller, Constance F. James and Jonathan I. Katz, *Washington U. in St. Louis*

8:30 a.m.

5.3 **Characterization of cortical bone using multiple scattering of ultrasound**, Yasamin Karbalaieisadegh, Omid Yousefian, Kay Raum, Gianluca Iori and Marie Muller, *North Carolina State U. and Charité – Universitätsmedizin Berlin*

8:45 a.m.

5.4 **Studying effect of pore volume fraction and pore size in cortical bone on ultrasonic parameters**, Omid Yousefian,

Yasamin Karbalaieisadegh and Marie Muller, *North Carolina State U.*

9:00 a.m.

5.5 **In-vivo characterization of lung parenchyma using ultrasound multiple scattering**, Kaustav Mohanty, John Blackwell, Thomas Egan and Marie Muller, *North Carolina State U. and U. North Carolina at Chapel Hill*

9:15 a.m.

5.6 **In-vivo feasibility of noninvasive and real-time acoustic assessment of inflammation**, Julian Garcia-Duitama, Boris Chayer, Damien Garcia, Yves Goussard and Guy Cloutier, *U. Montreal Hosp. Res. Ctr. (CRCHUM), U. Montreal and École Polytech. Montreal*

9:30 a.m.

5.7 **Ultrasound characterization of interface oscillation as proxy for ventriculo-peritoneal shunt function**, April Aralar, Matthew Bird, Robert Graham, Beomseo Koo, Mahesh Shenai, Parag Chitnis and Siddhartha Sikdar, *George Mason U.*

9:45 a.m.

5.8 **High-speed vector-flow imaging of in-utero mouse embryo at 18 MHz**, Jeffrey A. Ketterling, Orlando Aristizábal, Daniel H. Turnbull, Colin K.L. Phoon, Billy Y.S. Yiu and Alfred C. H. Yu, *Riverside Research, NYU Sch. Med., U. Hong Kong and U. Waterloo*

10:00 a.m.

5.9 **3D ultrasound imaging of pelvic floor muscle injury**, Qi Wei, Qi Xing, Connor Stapp, Parag Chitnis, Siddhartha Sikdar, Ghazaleh Rostami and Seyed A. Shobeiri, *George Mason U., Inova Women's Hosp., and Virginia Commonwealth U.*

10:15 a.m. **Coffee**

11:00 a.m. **6. PHOTOACOUSTICS**

Chmn: Muyinatu A. Lediju Bell, *Johns Hopkins U.*

6.1 **Theoretical application of short-lag spatial coherence to photoacoustic imaging**, Michelle Graham and Muyinatu Lediju Bell, *Johns Hopkins U.*

11:15 a.m.

6.2 **Evaluation of a convolutional neural network for identifying reflection artifacts in photoacoustic imaging**, Derek M. Allman, Austin Reiter and Muyinatu A. Lediju Bell, *Johns Hopkins U.*

11:30 a.m.

6.3 **Real-time photoacoustic imaging of microvasculature beneath the skin**, Yoshifumi Saijo, Ryo Nagaoka, Israr Ul

Haq, Syahril Siregar, Shin Yoshizawa and ShinIchiro Umemura, *Tohoku U.*

11:45 a.m

6.4 Photoacoustic quantification of brain-tissue oxygenation for focal stroke piglet model *in vivo*, Jeeun Kang, Haichong K. Zhang, Ernest Graham, Raymond C. Kohler and Emad M. Boctor, *Johns Hopkins U.*

12:00 p.m

6.5 Listening to membrane potential change through photoacoustic voltage-sensitive dye, Haichong K. Zhang, Jeeun Kang, Ping Yan, Diane S. Abou, Hanh N. D. Le, Daniel L. J. Thorek, Jin U. Kang, Albert Gjedde, Arman Rahmim, Dean F. Wong, Leslie M. Loew and Emad M. Boctor, *Johns Hopkins U.*

12:15 p.m. **Lunch**

2:00 p.m. **7. IMAGING 2**

Chmn: Gregg E. Trahey, *Duke U.*

7.1 Simulated and *ex vivo* large aperture imaging through human abdomen, Nick Bottenus, Will Long, Matthew Morgan, Gianmarco Pinton and Gregg Trahey, *Duke U., U. North Carolina at Chapel Hill and North Carolina State U.*

2:15 p.m

7.2 Beamforming improvement for non-contrast perfusion imaging with adaptive tissue-clutter demodulation, Jaime E. Tierney and Brett C. Byram, *Vanderbilt U.*

2:30 p.m

7.3 Ultrafast imaging of ocular blood flow, Ronald H. Silverman, Raksha Urs, Jeffrey A. Ketterling, Alfred C.H. Yu and Billy Y.S. Yiu, *Columbia U. Med. Ctr., Riverside Research, U. Waterloo and U. Hong Kong*

2:45 p.m

7.4 Nonlinear ultrasound propagation in homogeneous and heterogeneous media: factors affecting effective MI, Bofeng Zhang, Gianmarco F. Pinton, Yufeng Deng and Kathryn R. Nightingale, *Duke U., U. North Carolina at Chapel Hill and North Carolina State U.*

3:00 p.m

7.5 Quantitative 3D assessment of flow in a printed hydrogel vascular phantom, Samantha J. Paulsen, James Long, Bagrat Grigoryan, Wolfgang Stefan, Jordan S. Miller and Richard R. Bouchard, *U. Texas MD Anderson Cancer Center and Rice U.*

3:15 p.m. **Coffee**

4:00 p.m. **8. TISSUE PARAMETERS 3**

Chmn: Marie Muller, *North Carolina State U.*

8.1 Homodyned K-distribution parametric maps with application to assessment of vulnerable atherosclerotic plaques of internal carotid arteries, François Destrempes, Marie-Hélène Roy-Cardinal, Gilles Soulez and Guy Cloutier, *U. Montreal*

4:15 p.m

8.2 Delineation of lumen-plaque boundary in human carotid artery with ARFI Variance of Acceleration (VoA), Gabriela Torres, Tomasz J. Czernuszewicz, Jonathon W. Homeister, Mark A. Farber and Caterina M. Gallippi. *U. North Carolina at Chapel Hill and North Carolina State U.*

4:30 p.m

8.3 Effect of mechanical index on cardiac image quality, Katelyn Flint, David Bradway, Yufeng Deng and Gregg Trahey, *Duke U.*

4:45 p.m

8.4 Acoustic anisotropy in rodent cardiac tissue, M.L Milne and C.S. Chung, *St. Mary's Coll. Maryland and Wayne State U.*

5:00 p.m

8.5 Quantitative analysis of angiogenic microvasculature in tumor-bearing rats using multiple scattering, Aditya Joshi, Sarah Shelton, Virginie Papadopoulou, Brooks Lindsey, Paul Dayton and Marie Muller, *North Carolina State U. and U. North Carolina at Chapel Hill*

5:15 p.m. **Adjourn**

WEDNESDAY, JUNE 7

7:00 a.m. **Coffee and Pastry**

8:00 a.m. **9. ELASTICITY**

Chmn: Kathryn R. Nightingale, *Duke U.*

9.1 Constructive shear-wave interference velocimetry, Peter Hollender, Anna Knight, Mark Palmeri and Gregg Trahey, *Duke U.*

8:15 a.m.

9.2 Characterization of viscoelastic material using fractional-derivative measurements of group shear-wave speeds, Courtney A. Trutna, Ned C. Rouze, Yufeng Deng, Mark L. Palmeri and Kathryn R. Nightingale, *Duke U.*

8:30 a.m.

9.3 Characterization of human-liver dispersion using group shear-wave speeds, D. Cody Morris, Ned C. Rouze, Manish Dhyani, Anthony E. Samir, Mark L. Palmeri and Kathryn R. Nightingale, *Duke U. and Mass. General Hosp.*

8:45 a.m.

9.4 Imaging degree of anisotropy using Acoustic Radiation Force Impulse (ARFI) imaging, Christopher J. Moore, MD Murad Hossain and Caterina M. Gallippi, *North Carolina State U. and U. North Carolina at Chapel Hill*

9:00 a.m.

9.5 Improvement in beat-to-beat repeatability of myocardial strain estimation: preliminary *in vivo* results, Harrison Ferlauto, Vaibhav Kakkad, Brecht Heyde, Joseph Kisslo and Gregg E. Trahey, *Duke U. and Cardiovascular Imaging and Dynamics, Belgium*

9:15 a.m.

9.6 Relationship between ARFI-derived stiffness ratios and material elasticity: implications on transthoracic measurement of myocardial stiffness, Vaibhav Kakkad, Peter Hollender, Mark Palmeri and Gregg E. Trahey, *Duke U.*

9:30 a.m. Chmn: Caterina M. Gallippi, *N. Carolina State U.*

9.7 Accounting for finite observation window in measurement of shear-wave attenuation from two-dimensional Fourier-transform analysis of shear-wave propagation, Ned C. Rouze, Yufeng Deng, Mark L. Palmeri and Kathryn R. Nightingale, *Duke U.*

9:45 a.m.

9.8 Parameters contributing to variability in shear-wave attenuation estimates using amplitude-based methods, Sa-

mantha L. Lipman, Ned C. Rouze, Mark L. Palmeri and Kathryn R. Nightingale, *Duke U.*

10:00 a.m.

9.9 Estimation of phase-velocity dispersion in viscoelastic materials using the Multiple Signal Classification (MUSIC) method, Matthew W. Urban, Piotr Kijanka, Bo Qiang, Pengfei Song, Carolina Amador and Shigao Chen, *Mayo Clinic Coll. Med., AGH U. Science Tech. and Nielsen Co.*

10:15 a.m.

9.10 Evaluation of nonlinear modulus using compression of transplanted kidneys and shear-wave measurements, Sara Aristizabal, Carolina Amador, James F. Greenleaf and Matthew W. Urban, *Mayo Clinic Coll. Med.*,

10:30 a.m.

9.11 Shear shock waves observed in *ex-vivo* brain, David Espindola and Gianmarco Pinton, *U. North Carolina at Chapel Hill and North Carolina State U.*

10:45 a.m.

9.12 High frame-rate imaging and adaptive tracking of shear shock wave formation in brain: full wave and experimental study, David Espindola and Gianmarco Pinton, *U. North Carolina at Chapel Hill and North Carolina State U.*

11:00 a.m.

9.13 Piecewise parabolic method for propagation of shear shock waves in soft solids, Bharat B. Tripathi, David Espindola and Gianmarco F. Pinton, *U. North Carolina at Chapel Hill and North Carolina State U.*

11:15 a.m. **Adjourn**

GENERAL INFORMATION

REGISTRATION

All attendees are charged a registration fee to help defray the costs of conducting the Symposium. The general registration fee is \$550 (\$590 if postmarked after **May 11**). Graduate students who identify their school and advisor on the registration form will be charged \$350 (\$380 after **May 11**). **Postdoctoral fellows must pay the full registration fee.**

Advance registration is requested in order to complete local arrangements. Please send the registration card (p. 7) along with your registration fee (checks made payable to “Tissue Characterization Symposium,” *no purchase orders, please*) to:

**Symposium on Ultrasonic Imaging
and Tissue Characterization**
2 Fulham Court
Silver Spring, MD 20902

Checks must be in U.S. dollars and drawn on a U.S. bank. Add a \$30 processing fee if the check is not drawn on a U.S. bank.

You can pay by credit card for an additional \$25 fee *per registration* (\$15 additional for student registration). Please send the registration card (p. 7) with your credit card number, expiration date and 3- or 4-digit security code either by: (1) mail to the above address, (2) fax to (301) 649-3447 or (3) email attachment to mclinzer@verizon.net. As a security precaution, do not send your credit card information in the body of an email.

Late registration will be held at the Westin Arlington Gateway beginning at 7:00 a.m. on Monday, June 5.

HOTEL

The Westin Arlington Gateway is the venue for all meeting activities. It is a four-star luxury hotel located in Arlington, VA. The meeting will take place in a beautiful, large ballroom, with spacious classroom seating for 125 attendees. Very-high ceilings and absence of support pillars provide unrestricted views of two large projector screens.

The hotel is surrounded by a large number of restaurants. Amenities include an indoor heated pool and whirlpool, a 24-hour fitness center, a Starbucks and a 24-hour business center. Free WiFi, as well as free access to three computers and a color printer, are provided in the hotel lobby. For additional information, see the hotel web site: westinarlingtongateway.com.

ROOM RESERVATIONS

The Symposium has guaranteed a *limited number of rooms* at a special Symposium rate of \$259 for a single or double room. The cut-off date for reserving a room at this rate is **May 11, 2017**. However, if you are planning to attend the meeting, we urge you to make your room reservation as soon as possible. You can make a reservation via:

<https://www.starwoodmeeting.com/events/start.action?id=1606237306&key=AEDCC6D>

Alternatively, you can call the Central Reservations office at (888) 627-7076 and request the rate for the Tissue Characterization Symposium conference.

SOCIAL PROGRAM

A continental breakfast will be served each morning before the sessions. Coffee and tea will be available during the morning sessions and coffee, tea and cold drinks at mid-afternoon breaks.

CASUAL DRESS CODE

Dress code is casual, e.g., no ties or jackets for men. Casual dress will make all of us more comfortable, simplify our packing and help maintain an atmosphere of open and informal dialog at the Symposium.

TRANSPORTATION

The Westin Arlington Gateway is located two blocks from the Ballston Metro station, placing it within minutes of downtown Washington, Capitol Hill and National Airport (Blue Line). Bus service to Dulles Airport, as well as to New York City, is available near the Rosslyn Metro station, a few subway stops away. The NYC Tripper and Vamoose buses cost as little as \$30 each way and feature free WiFi and electrical outlets. The hotel is also serviced by shuttle service from National and Dulles Airports. Hotel valet parking is available at \$26/day.

PROGRAM AND ABSTRACTS

Prior to the meeting, the program and abstracts will be sent to our mailing list and made available on our website: uitc-symposium.org. Downloading these files onto a laptop, tablet or smartphone will allow attendees to read and annotate them during the sessions.

EXHIBITS

A limited amount of exhibit space for commercial scientific equipment is available just outside the meeting ballroom. Contact Mel Linzer for more information on exhibit options.

FOR ADDITIONAL INFORMATION, contact:

Dr. Melvin Linzer, *Executive Chairman*
**Symposium on Ultrasonic Imaging
and Tissue Characterization**
2 Fulham Court
Silver Spring, MD 20902

Phone: (301) 649-6886 Fax: (301) 649-3447
Email: mclinzer@verizon.net

SYMPOSIUM REGISTRATION FORM

42nd International Symposium on Ultrasonic Imaging and Tissue Characterization
Westin Arlington Gateway, Arlington, VA June 5 – 7, 2017

Please return as soon as possible to assist us with planning for the Symposium.

Mail to: *Symposium on Ultrasonic Imaging and Tissue Characterization*, 2 Fulham Court, Silver Spring, MD 20902

Name _____

Organization _____

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Telephone _____ Fax _____ Email _____

___ Registration fee enclosed (\$550) (If postmarked after **May 11**, fee is \$590)

___ Graduate student registration fee enclosed (\$350) (After **May 11**, fee is \$380)

Faculty Advisor Telephone Email