

Ultrasonic Industry Association

2010 Symposium: Powering Sound Ideas, Cambridge, MA, USA



Courtesy Greater Boston Convention and Visitors Bureau

The UIA Symposium will be held on 12 - 14 April at the Royal Sonesta Hotel in Cambridge, MA, USA.

The Symposium is divided into three separate days -- and registration will be available daily or for the full symposium.

Monday's focus is on industrial and scientific

applications of ultrasound. The featured speaker is Avraham Benatar, Director, Plastics and Composites Joining Lab, Welding Engineering, The Ohio State University on *Servo-Driven Ultrasonic Welding of Semi-Crystalline Thermoplastics*.

Tuesday will feature a poster session, two workshops, and a tour of the Physical Acoustics Laboratory at Boston University.

Wednesday's focus is on medical applications.

The featured speaker is Robin Cleveland, Associate Professor, Department of Mechanical Engineering, Boston University on *Medical Applications of Shock Waves*.

International Presentations

Speakers from such diverse technology hubs as China, Denmark, Germany, Singapore, US, and the United Kingdom are scheduled to present and give insight to current ultrasonic research initiatives from around the world.

Symposium Highlights

- Industrial and Scientific Sessions Monday, 12 April, 2010
- Workshops, Poster Sessions and PACLAB tour on Tuesday, 13 April, 2010
- Medical Sessions Wednesday, 14 April, 2010
- Special evening tour of MIT and dinner on Tuesday, 13 April, 2010

Best Ultrasonic Product

Ethicon Endo-Surgery is sponsoring the Best Ultrasonic Product 2010 Program. UIA is looking for unique products that showcase the advantages of ultrasonics.



This award will be presented on Monday afternoon, April 12, 2010 during the UIA Symposium.

Winning this award not only gives "bragging rights" to the company, but also provides additional promotional opportuni-

ties such as press releases announcing the recognition of our industry leaders of your innovations.

The deadline for submitting entries is **28 February 2010**.

The entry form and more information are available at www.ultrasonics.org

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2010 Symposium Industrial Scheduled Presentations

- 7:45-8:15 *Registration and Continental Breakfast*
- 8:15-8:30 Welcome by Robert Muratore, President, and Leo Klinstein, Co-Chairman
- 8:30 -9:00 Optimizing Piezoelectric Ceramic Thickness in Ultrasonic Transducers,
Dominick A. DeAngelis, Gary W. Schulze
- 9:00 - 9:30 Ultrasonic Cutting of Biodegradable Polylactic Acid (PLA) Films,
David Grewell, Julius Vogel
- 9:30-10:00 Determining Bond Quality from VHPUAM Process Parameters, *Matt Short*
- 10:00 - 10:45 *Refreshment Break in Exhibits*
- 10:45-11:15 UAM Fabrication of Metal-Matrix Smart Material Composites,
Ryan Hahnen and Marcelo Dapino
- 11:15-11:45 Ongoing Developments in Ultrasonic Machining, *Matt Short*
- 11:45 -1:00 *Luncheon*
- 1:00 - 1:15 New Product Award Presentation
- 1:15 - 2:15 Servo-Driven Ultrasonic Welding of Semi-Crystalline Thermoplastics,
Keynote Speaker: Avraham Benatar and He Xiping
- 2:15-2:45 Protease Inactivation in Milk by Thermo-sonication and Impact on Milk Char-
acteristics, *Sakthi Vijayakumar, David Grewell, Stephanie Jung, Stephanie Clark*
- 2:45-3:15 Efficiency Improvement for Power Ultrasonic Transducer Systems,
John Yen, Laura Yao, Lihong Cheng
- 3:15-3:30 *Refreshment Break in Exhibits*
- 3:30-4:00 Ultrasonic Brazing Developments, *Shankar Srinivasan and Dan Hauser*
- 4:00-4:30 Measurement of the Acoustic Softening Effect in Forming and Joining of
Metals, *Margaret Lucas, Sa'ardin Aziz*
- 4:30-5:00 Advanced Analysis and Characterization of the UAM, VHP UAM Bonding
Process, *D. Schick, R. DeHoff, M. Sriram, R. Hahnen, M. Dapino and S. S. Babu*

"The UIA
Symposium offers
one of the best
opportunities to
meet with key
ultrasonic industry
members from around
the world."

*2009 Symposium
Participant*

Schedule subject to change

2010 Symposium Medical Scheduled Presentations

- 7:30-8:05 *Registration / Continental Breakfast*
- 8:00-8:15 Welcome Robert Muratore, President, and Dan Cotter, Co-Chairman
- 8:15 -9:15 Medical Applications of Shock Waves, *Keynote Speaker: Robin Cleveland*
- 9:15-9:45 Correlation of Acoustic Pressure with BBB Disruption in a Primate Model,
Al Kyle and Matt Lawrence
- 9:45-10:15 Real-time Monitoring of Tissue Deformation and Targeting during Robotic
FUS, *Sunita Chauhan*
- 10:15 - 11:00 *Refreshment Break in Exhibits*
- 11:00-11:30 Realtime acousto-optical QA methods for high intensity fields,
Ian Butterworth and Adam Shaw
- 11:30-12:00 Metrology Research for External Beam Cancer Therapy,
Dr. Klaus-Vitold Jenderka
- 12:00 -1:00 *Luncheon*
- 1:00 - 1:30 High Frequency Transducer Based on Lead Free Piezoceramic Thick Film,
Karsten Hansen, Konstantin Astafiev, Rasmus Lou-Mueller, Wanda Wolny
- 1:30 - 2:00 Propagating Ultrasound Energy Through a Catheter Around Bends,
David Constantine, James Sheehan and Jeffrey Vaitekunas
- 2:00-2:30 The Evolution from Ultrasonic Dental Scaling to Bone Surgery,
Andrew Mathieson, Niccolo' Cerisola, Andrea Cardoni
- 2:30-2:50 *Refreshment Break in Exhibits*
- 2:50-3:20 Multidimensional Analysis of Ultrasonic Surgical System Performance,
Mark E. Schafer
- 3:20-3:50 A Deformable Template Model With Feature Tracking For Automated
Ivus Segmentation, *Prakash Manandhar and Chi Hau Chen*
- 3:50-4:20 A Novel Ultrasound Method for Estimating Lesion Volume
Bahram Jadidian, Alan Winder, Robert Muratore

"I made effective
contact with
potential research
partners at the
UIA
Symposium."

*2009 Symposium
Participant*

Check www.ultrasonics.org for updated information and registration link

Schedule subject to change

Student Posters are still being accepted. Go to www.ultrasonics.org for more information

Tuesday Workshop and Poster Session Schedule

- 7:30-8:00 Continental Breakfast
- 8:00-9:15 Workshop I, **Newcomers to Ultrasonics**
- 9:15 - 9:45 Refreshment Break in Exhibits
- 9:45-11:00 Workshop II, **Finite Element Modelling**,
- 1:30- 4:00 Tour of the Physical Acoustics Laboratory at Boston University
- 5:00 Depart for MIT Tour and Dinner

Schedule subject to change

Tuesday Workshop Descriptions

Tuesday morning features two workshops: **The Newcomers to Ultrasonics Workshop** provides the fundamentals of ultrasonic transducer and acoustic design analysis. This workshop will detail the technical foundation of acoustic modelling such as spring / mass systems, equivalent circuit models, series and parallel systems, and basic characterization methods. A process of ultrasonic transducer design using electrical and mechanical analysis methods will be outlined. Techniques of finite element analysis using ANSYS will be introduced, covering such topics as material characterization and setup, static, modal and harmonic analysis, and post processing of electrical and mechanical results. Some advanced topics such as ANSYS generated impedance curves and heat modeling will also be presented.

The Finite Element Methods for Modelling Transducers Workshop will be the first of its kind - a discussion and comparison of some of the commercially-available Finite Element Analysis (FEA) Programs used in modeling Ultrasonic Transducers. A typical transducer type will be analyzed using a range of different programs, and then the experiences of each package will be compared regarding several criteria, such as: hardware requirements, ease of use, inputs required, outputs obtained, and cost.

2010 Symposium Committee

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Tony Crandall

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Leo Klinstein

Medical Session Co-Chairs
Dan Cotter and Mark Schafer

Poster Chair
Jay Sheehan

Workshop Chair
Mark Hodnett

Low Frequency Ultrasonic Transmissions to Assess Tissue Lesion Volume

Low frequency interrogation is a growing modality for its ability to provide unique target classification information, such as size, shape and composition. A particularly useful frequency regime, based on Synthetic Structural Imaging (SSI) physics, builds on the target's ramp signature response, previously successful in radar studies of air-wing identification and in sonar imaging of underwater scaled targets. Fundamental to the success of the SSI method is the property that the derived physical optics approximation of the target's ramp response, referred to as the profile function, is directly proportional to the target cross-sectional area along the direction of propagation of the incident field. If the ramp response is integrated over the insonified target in the direction of the propagating wave, the resulting parameter is a unique, spatially-invariant measure of the target volume. The SSI

method has less resolution than conventional high frequency imaging but its correlation to size and shape is much stronger and is considerably more robust.

A study was performed to determine whether SSI physics can be extrapolated to biological targets, such as tissue lesions. Customized tissue-mimicking phantom models were fabricated with embedded spheroidal inclusions ranging from 2-mm through 7-mm in diameter. The phantom medium was 10 wt% porcine gelatin (with an acoustic velocity of 1530 m/s) and the inclusions were 28 wt% porcine gelatin (with an acoustic velocity of 1684 m/s). The inclusions were measured manually with calipers. Low frequency transmissions (0.3-1.3 MHz) in burst mode were used to insonify the custom phantoms. The backscattered echo signatures were recorded, normalized with respect to the effects of the medium and

transducer, filtered and time-gated to produce experimentally-derived profile functions which were integrated to produce estimates of the lesion volumes. Preliminary test results indicated that clinically useful volume estimates, having estimation errors less than 7%, are possible.

The potential clinical benefits of the SSI method are considerable, most notably, to improve early breast cancer detection and to guide therapies utilizing ultrasonic ablation. Examples of the latter are the therapeutic monitoring of tumor shrinkage with chemotherapy or high-intensity therapeutic ultrasonic ablation, providing estimates of the size of dense masses in breast and other tissues. The SSI method may also facilitate biopsies of tumors detected with MRI which are not detectable on a mammogram, i.e., those with diameters less than 5 mm.

This paper by Bahram Jadidian (1), Alan Winder (1) and Robert Muratore(2) will be presented on Wednesday during the Medical Session

- (1) J&W Medical LLC,
- (2) Quantum Now LLC

This paper by Ryan Hahnen and Marcelo Dapino Department of Mechanical Engineering, The Ohio State University, Columbus, Ohio, will be presented on Monday during the Industrial Session.

UAM Fabrication of Metal-Matrix Smart Material Composites

Ultrasonic additive manufacturing (UAM) is used to create composites with seamlessly embedded smart materials. Since UAM is a relatively low-temperature, solid-state process, it is particularly favorable for embedding shape memory alloys (such as NiTi) into aluminum without altering the unique thermoelastic properties of these materials. Al/NiTi composites with up to 22.3% vol. NiTi have been made by

the UAM process. The composites exhibit a 5.5% increase in stiffness when heated due to the modulus difference between the low-temperature martensite phase and the high-temperature austenite phase. The stiffness change is promising for tunable vibration absorption applications. The shape memory effect of NiTi also allows the composite to recover up to 58% of the thermal expansion of the Al matrix.

The resulting thermal invariance could be useful for maintaining dimensional tolerances in components exposed to thermal fluctuations. The embedded NiTi wires could also act as strain sensors. The stress-induced transformation between the martensite and austenite phases creates large changes in electrical resistance, approximately 20%, which can be detected with a simple electrical circuit.

Unique Tuesday Evening at MIT and More...



Photos courtesy of Corinthian Events

UIA has planned an up-close and personal tour of the Massachusetts Institute of Technology with a tour guide unlike any other.

Joost Bonsen will be our MIT host. Bonsen helped start several clubs and courses at MIT, and helped author a study on the impact of MIT start-ups on the global economy. He is a central node in the MIT network; the guy who can make the connection you need. He will lead you on an insider's tour of the MIT campus, pointing out discoveries and inventions that have happened, what research themes are emerging today and what famous companies have "spun out" of MIT's intensely innovative atmosphere.

The unique evening continues with a visit to a restaurant over the river that tips its hat to the history that formed this great city. It is known as the home to the first use of the toothpick in the United States. Charles Foster of Maine imported the toothpicks from South America and promoted the business by hiring Harvard boys to dine at the Union Oyster House and ask for toothpicks.

The Union Oyster house claims itself as America's oldest continuously operating restaurant, open to diners since 1826, Ye Olde Union Oyster House is wall to wall history...literally. Complete

with low ceilings, wooden booths, lobster tanks, and a raw bar (that has existed since it opened), the ambiance of the restaurant is casual and fun. Even John F. Kennedy considered it one of his favorite spots and a booth has been dedicated in his name.

Following dinner we will take an evening stroll accompanied by a professional tour guide that will walk us through historic Faneuil Hall and along the new Rose Kennedy Greenway. At the Old State House we will board a waiting motorcoach to return to the Royal Sonesta.

UIA Forum: Up and Running

By Ronald Manna

The UIA would like to announce a new resource available to all UIA members. It is the Member Forum page located at <http://forums.ultrasonics.org/>.

Here all persons interested in subjects related to High Power Ultrasound, including Focused Ultrasound, can view posts concerning Ceramics, New Ultrasound Products, The Science of Ultrasound, Job Postings and other topics which may help in your work or even if they are of general interest to you.

Members may post new topics, answer questions posed in the threads or ask questions about the broad arena of power ultrasound. Guests will be able to read and search the topics but will not have access to the full forum toolkit. This will allow potential members to discover the full depth of knowledge our membership has in the ultrasound field and hopefully encourage them to join the discourse.

Keep in mind that questions and comments will be seen by some of the best

practitioners of the art of ultrasound from around the world. Our Board Members have agreed to provide consultation on general questions at no charge. We suspect that the answers will be invaluable in furthering the understanding and expanding the use of ultrasound to solve problems in medicine, industry and science.

The UIA encourages you to spend some time with the website and post any topics of interest to you in the field. General topics, such as the state of the industry, would be welcome as well.

Attention UIA Members

MEMBER PROFILES offers members the opportunity to write about themselves or their company, complete with keywords and links. Check out the forum!

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An Open Letter to James Cameron: 1% for Science

By Robert Muratore, Ph.D.

US\$387 million was spent on the production and the marketing of the recent Twentieth Century-Fox Film Corp. movie *Avatar* [1]. Meanwhile, the video game industry is outgrowing the movie industry at a break-neck pace, with revenues expected to exceed US\$60 billion next year [2]. These are two examples of what economists have long known: the entertainment industry expands explosively when the economy is otherwise depressed [3].

Unfortunately, the other cylinder of the economic engine, research, is misfiring. Spending in research and development at large corporate laboratories seems steady, but a detailed look reveals two troubling facts: (1) R&D budgets are set a couple of years in advance, not yet reflecting the worst of the recession; (2) R&D is now focused on short-term payouts, i.e., safe, engineering refinements rather than fundamental scientific breakthroughs [4]. Venture

capitalists are similarly myopic; their current investors seek shorter term gains. Government spending on R&D is near record levels, but exhibits the lottery problem: the number of applicants grows faster than the fund, reducing the chance of any one researcher receiving funding.

Over a century ago, wealthy industrialists donated cultural treasures (e.g., Carnegie Hall). More recently, during an economic boom, various communities began to commit "One Percent for Art", in order to balance industrial and cultural growth. The One Percent movement was codified in some places. For example, in New York City, a fraction of the construction budget of municipal buildings is set aside for public art to accompany the building, as sculpture in a plaza, murals in the lobby, etc. Other communities, defined geographically or through another common interest, have taken on a One Percent commitment

voluntarily. Thus the One Percent movement has taken private and public money and placed it into the arts.

How are the arts doing now? A third of a billion dollars tells a story. The entertainers have the deepest pockets. They are indeed generous. We can be thankful for charity concerts, the development of new technologies for the motion picture industry, and the inspiration of future scientists and engineers.

Despite the magnificent generosity of the entertainers, the magnitude of the movie budgets seems out of balance with a productive society. Is it excessive to spend a third of a billion dollars to tell a story, a story of people who can plug into some other reality, that is, attach themselves to a machine that will communicate directly with their brains? For 1% of the story telling budget we can actually do what the storytellers dream about. The choice is clear: spend billions on sto-

An Open Letter, continued

rytelling, or spend 99% on the same stories, and 1% to actually bring the best of the story elements to reality.

I call upon the movie makers with the largest visions and the largest budgets (that's you, Mr. Cameron) to imagine what these new elements of reality could be. Let me offer a few examples from my own industry, ultrasonics, in approximate order from the nearest to the farthest from fruition:

* Supermaterials are enabled by ultrasonic welding. Athletes, especially swimmers, wear seamless suits and break records. Svelte lightweight cars are built of bonded polymers and alloys.

* Breast cancer tumor volumes are revealed rapidly and inexpensively by ultrasound, enabling diagnosis and treatment planning for underserved populations.

* Rhythmic flexing of bone cells by the mechanical action of pulsed ultrasound promotes the rapid healing of spinal fractures.

* Surgery without incision relies on intense focused beams of ultrasound. Cures for liver cancer and ventricular tachycardia are at hand but the funding is hard to come by.

* Direct brain stimulus can be delivered via safe ultrasound levels. Work is at the earliest stages [5]. Possible future applications include treatment of neurodegenerative diseases, including non-surgical interventions in utero, non-drug enhancements of brain functions, and of course, directly plugging into cyberspace.

1% for science will power these sound ideas and bring them to life.

"True to life, true to life, there are complications and compensations, if you know the game." [6]

REFERENCES

- [1] Patten D. 'Avatar's' True Cost -- and Consequences. The Wrap, 2009 Dec 03.
- [2] Maragos N. Game Industry Revenue Expected To Double By 2011. Gamasutra News, 2006 Feb 16.
- [3] Winters Keegan R. How Will Recession Affect the Entertainment Biz? Time Magazine, 2008 Oct 24.
- [4] Scheck J, Glader P. R&D Spending Holds Steady in Slump. The Wall Street Journal, 2009 Apr 6.
- [5] Muratore R, LaManna JK, Lamprecht MR, Morrison B. Bioeffects of Low Dose Ultrasound on Neuronal Cell Function. Proceedings of the 38th Annual Symposium of the Ultrasonic Industry Association. IEEE Xplore, 2010 [forthcoming].
- [6] Ferry B. True to Life. Avalon. Virgin Records, 1982.

For 1% of the story telling budget we can actually do what the storytellers dream about.

Exhibit and Sponsor Information

Royal Sonesta Hotel

UIA offers companies access to key influencers in the international ultrasonics community at their annual symposium. This year, we offer both exhibit and sponsorship opportunities:

Sponsorship Levels

Level One - Refreshment sponsorship - \$1,500

includes recognition in symposium literature, logo on refreshment table, and one symposium registration;

Level Two - Breakfast sponsorship - \$1,995

includes recognition in symposium literature, logo on buffet table, and one symposium registration;

Level Three - Lunch sponsorship - \$2,750

includes recognition in symposium literature, signage at lunch, and one symposium registration;

Exhibit Opportunities

Level One Exhibitor – UIA Corporate or

Sustaining Member \$1,395 - includes recognition in symposium literature, 6' x 3' table and one full symposium registration;

Level One Exhibitor – Non Member \$1,745 -

includes recognition in symposium literature, 6' x 3' table and one full symposium registration;

Level Two Exhibitor – UIA Corporate or

Sustaining Member \$2,095 - includes recognition in symposium literature, 6' x 3' table and two full symposium registrations.

Level Two Exhibitor – Non Member \$2,445 -

includes recognition in symposium literature, 6' x 3' table and two full symposium registrations.

Please use the form attached or contact *UIA* for more information



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**39th Annual UIA Symposium Registration
12 - 14 April 2010
Royal Sonesta Hotel, Cambridge MA USA**

First Name

Last Name, Designation

Nickname for badge

Position/Title

Employer

Employer City/State

For mailing purposes, I prefer my

- Home address as follows:
 Work address as follows:

Address

City, State, Zip, Country

Phone

E-mail

Please register me in the following manner:

Full Registration includes, Tuesday evening event - please check boxes to confirm your participation

- Full conference registration
 YES, I will attend Tuesday Evening

Select for which category you are registering:

- Member Nonmember Exhibitor
 Speaker Student Sponsor

Daily Registration

Tuesday does NOT include Tuesday Evening Event

Select which day: Select your category:

- Monday Member
 Tuesday Nonmember
 Wednesday Speaker
 Student

Special Events

- Tuesday Evening Event # of Tickets _____

Fee Schedule

Full conference (Monday - Wednesday)

Full conference - Member	\$875
Full conference - Nonmember	\$995
Speaker - Full conference	\$750
Student - Full conference	\$495

Daily fees (Monday, Tuesday or Wednesday)

Daily Rate - Member	\$295
Daily Rate - Nonmember	\$400
Speaker - Daily	\$295
Student - Daily	\$195

Exhibit Levels - Members

I - 1 table, 1 full registration	\$1,395
II - 1 table, 2 full registrations	\$2,095

Exhibit Levels - Non members

I - 1 table, 1 full registration	\$1,775
II - 1 table, 2 full registrations	\$2,475

Sponsorship Levels

I - Refreshment Sponsor	\$1,500
II - Breakfast Sponsor	\$1,995
III - Lunch Sponsor	\$2,750

Special Events

Tuesday Evening Event	\$225
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NOTE: Tuesday evening is included in the FULL conference registration fee. Additional tickets may be purchased for companions.

Payment Summary FIN for voucher use only: 13-6130371

Conference Registration	\$ _____
Tuesday Evening Event	\$ _____
TOTAL DUE	\$ _____

Method of Payment

- Payment enclosed. Make check payable to UIA.
 Charge Credit Card: MasterCard Visa
 UIA accepts only these two credit cards!

_____|_____|_____|_____| _____|_____|_____|_____| _____|_____|_____|_____| _____|_____|_____|_____|

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You may register on-line at www.ultrasonics.org

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How can ultrasonics enhance the value of your business?

UIA is the international business forum for users, manufacturers, and researchers of ultrasonics. Our members use acoustic vibrations to improve materials, industrial processes, and medical technology. We call this "powering sound ideas."

Cambridge/Boston is

... convenient, compact, and walkable. From downtown Boston, you can easily walk to the major hotels, shops, theaters, historic sites, clubs, and restaurants. You'll discover why Boston is called one of this country's most walkable cities. Our hotel is located close to the MIT and Harvard campuses.

... a city of historical and cultural contrast. The old-world atmosphere of Boston, created more than 350 years ago is mixed with the excitement of modern-day events, art, and culture. Historic buildings and landmarks are sandwiched between magnificent new towers that illuminate the sky; lazy cobblestone streets that lead into bustling thoroughfares; and a busy working waterfront that has sustained and delighted Bostonians and visitors for more than three centuries.

... alive with activity, Boston has an international reputation as a center for education, new technology, finance, architecture, and medicine. Boston is also known for its museums, concerts, dance events, festivals, and theatrical performances.

To help UIA participants tour the area, there are two Hop-on Hop-off style tours that depart from the Royal Sonesta Hotel:

Old Town Trolley

<http://www.historictours.com/boston>



Adult Ticket Price: \$36.00

9:15AM pick up at Royal Sonesta each morning –

Tour runs 9:00AM- 4:00PM in April

Super Tours – Super Upper Decker & Cambridge Trolley loop



<http://www.bostonsupertrolleytours.com> Adult Ticket Price: \$34.00 – good for 2 days

Tour runs 9:00AM-6:00PM

Tour begins at Long Wharf. Guests may begin and board at Cambridge Side Galleria across from hotel.

Royal Sonesta Hotel

With breathtaking views of Boston and the Charles River, this luxury hotel is just moments from the heart of Boston, in the midst of famous Cambridge and Boston area shops, museums, and historic sites. Guest rooms offer first-class amenities and stunning views of the Charles River, Cambridge, or Boston. Unwind at the Sonesta Health Club with an indoor/outdoor pool, 24-hour fitness center, and saunas. 24-hour access to the Business Center, Browse at the Cambridge Side Galleria with over 100 retail shops and an international food court, directly across from the hotel. The hotel is only three miles from Logan International Airport.

UIA Room Rate: \$179 single/ double plus tax 12.45%

Make Your Reservations

- 1) by calling the Hotel directly at +1.617-806-4200 and asking for Reservations;
- 2) by emailing the Hotel directly at reservations@sonesta-boston.com; or
- 3) by using the reservation link at www.ultrasonics.org

Mention you are attending the UIA Symposium for this rate.