



Vibrations

2010 Symposium Location Announced: Boston/Cambridge, MA



Symposium Highlights

- Industrial and Scientific Sessions Monday, 10 April 2010
- Medical Sessions Wednesday, 12 April 2010
- Workshops/Tour on Tuesday, 11 April 2010
- Special evening event on Tuesday, 11 April 2010
- Preliminary Program available Fall 2009

The UIA Symposium will be held on 12 - 14 April 2010 at the Royal Sonesta Hotel Cambridge, across the river from Boston, Massachusetts.

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.

Tuesday will feature a selection of workshops with in-depth information on ultrasound design considerations. A tour of Boston University's Applied

Acoustics and Ultrasonics Laboratory will be featured on Tuesday.

Wednesday's focus is on medical applications. See inside for more information about this Symposium.

Inside this issue:

Call for Papers for Boston Symposium

Plan now to submit your paper for consideration for the 39th Annual UIA Symposium.

Papers are being sought in the Industrial and Scientific arena as well as for Medical ultrasound applications.

The deadline for submitting your 200 word description is **August 31, 2009.**

Session chairs will review potential presentations and determine whether they will be presented in a 25 minute time slot or as part of the poster presentations on Tuesday morning, April 11.

Please see the Call for Papers form on page 10 for more information.

Please forward this information to your colleagues or academicians who might have important information to share with the ultrasonic industry next April.

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2009 Symposium - Vancouver BC Canada

Despite the worldwide economic downturn, the 2009 UIA Symposium was a resounding success. Nearly 60 delegates attended the event, held at the Harbourside Renaissance, Vancouver, BC, on the 23-25 March 2009, and heard the latest technical developments in high power ultrasound.

A similar program structure to recent Symposia was adopted, with the opening day devoted to Industrial Ultrasound. The Symposium was opened by UIA President Robert Muratore, and the technical program commenced with an overview of new developments at the Edison Welding Institute from UIA honorary member Karl Graff, in the first of his three presentations, highlighting in particular a 9 kW push-pull welding approach, and the application of high power ultrasound to significantly improve twist drilling processes.

Dominick DeAngelis from Kulicke and Soffa then described his work in optimising transducer preloading to improve process consistency and lifetimes, with application in wire-bonding: a production line benefitting from the designs is able to manufacture at an astonishing 40 bonds per second. George Bromfield then brought us up to date with a presentation on a modelling techniques for torsional mode transducers, work carried out in conjunction with Penn State University.

Following morning refreshments in the exhibition area, generously sponsored by Dukane Intelligent Assembly Solutions, some leading-edge work was described by Dukane's Leo Klinstein, who collaborated with William Sato from Ultex Corporation in the development of a novel ultrasonic cutting machine, used in the semiconductor industry.

In concluding the first morning session, Karl Graff, speaking on behalf of his colleague Matt Bloss, told us about some recent EWI development work in welding

superalloys, particularly focusing on the need for new tungsten-based tool designs to cope with the high temperatures generated at the weld interface.

Luncheon was taken in the panoramic surroundings of the 17th floor Vista restaurant, offering stunning views across Vancouver and its environs.

resultant cavitation caused by multi modal behaviour in a cylindrical 25 kHz ultrasound cell, and the subsequent general need for incorporating temperature control to improve acoustic field stability.



Karl Graff, EWI

Article and all
symposium photos
by Mark Hodnett



**Leo Klinstein, Dukane
Intelligent Assembly
Solutions**



**Mark Hodnett accepting
award from Janet Devine**

Prior to the commencement of the afternoon technical sessions, the 2009 UIA Outstanding Product Award was presented to the National Physical Laboratory, UK, for their development of the cavitation sensor and Cavimeter, bringing to the marketplace a new measurement capability for high power ultrasonic systems. In accepting the award, Mark Hodnett from NPL gave a history of the device development and realisation.

The industrial session keynote speaker, Dave Grewell from Iowa State University, then provided a fascinating, detailed overview of the uses of high power ultrasound in enhancing the production of sustainable fuels, including examining the use of alternative stock materials such as switchgrass, the optimisation of biodiesel production by using pulsed-mode ultrasound, and the realisation of pilot-scale production plants based on cylindrical horn sonicators.

Mark Hodnett from NPL then returned to the stage to describe recent work in investigating the variations in acoustic pressure and



Karl Graff gave a detailed review of the work of Dr Bob "Doc" McMaster, a pioneering, innovative leader in the development of ultrasound NDT and high power applications, who combined a distinguished scientific career spanning more than 40 years, with being one of the first recognised TV weathermen.

George Keilman from Sonic Concepts then presented the design, development and implementation of a very interesting application of ultrasonics – to track threatened and endangered salmon species, primarily in the Snake and Columbia rivers. Doing so necessitated the design of a micro transmitter, implanted in subyearling fish, and a complementary receiving hydrophone array and detection system.

The closing presentation of the Industrial Session was given by Leo Klinstein from Dukane, taking the delegates through the latest developments in the IQ series of Ultrasonic Systems, in particular the implementation of servo motor control for precision positioning during welding processes to maintain quality in product manufacture, reducing pull force variation. Sono-bond Ultrasonics then generously sponsored the evening wine and cheese reception to draw the first day of the Symposium to a close.

The main feature of day two was

2009 Symposium *continued*

the workshops. These were kicked off by **Dave Wuchinich** from



Modal Mechanics, who gave an overview of techniques for determining material properties for ultrasonic horns, in particular for evaluating Q under cyclic stress conditions, and also showing a method for applying iterative measurement and finite element analysis

to determine Young's modulus and Poisson's ratio.

The second workshop was presented by Wanda Wolny and Rasmus Lou-Moller from Ferroperm, who gave an interesting and detailed overview of the practical application of material data provided by piezoceramic firms, including details of manufacturing processes and the need to consider likely driving conditions and electrodes when selecting a material.

Following a delightful Greek-themed lunch in the Vista restaurant, the final workshop presentation was given by Karl Graff. Karl delivered a comprehensive overview of the principles and applications of high power ultrasonics, giving the benefit of his prodigious experience in the field, and presenting some less well-known industrial processes that demonstrated the enormous breadth of applications, particular those used in the food and metal-forming industries.

The final session of Day 2 was for Industrial and Medical posters, and gave all symposium participants the opportunity to network informally

and discuss in detail the technical advances being made, in areas as diverse as modelling of chaotic bubble oscillations in HIFU (Amin Jafari Sojahrood, Urmia University Iran), through the wetmilling of crystalline organic materials (Mike Eglesia, Merck) to the development of ultrasonic drilling/coring means for planetary rock sampling (Margaret Lucas, University of Glasgow).



The evening of Tuesday 24th March saw the Symposium Dinner Cruise. Participants networked and relaxed on board a private yacht, and enjoyed a beef tenderloin and salmon buffet whilst touring the Burrard Inlet, taking in the beautiful scenery of the Vancouver north shore and urban cityscape.

The final day of the Symposium was devoted to medical applications of



high power ultrasound, and UIA was proud to welcome Professor **Larry Crum** from the University of Washington as its guest speaker. Larry spoke on some of the forefront technical aspects of HIFU, discussing applications as diverse as ultrasound-assisted gene therapy, through to the development and use of lithotripters in space.

Dr Eliaz Babaev, CEO of Arobella Medical, then gave an overview of the latest developments in the use of ultrasound for wound healing,

focusing in particular on the Qoustic treatment system.

UIA President **Robert Muratore** described some fascinating early work on the bioeffects of ultrasound on neuronal function, using a high frequency, low acoustic dose system to investigate responses in rat hippocampal cultures, and demonstrating a similar function to electrical stimuli.



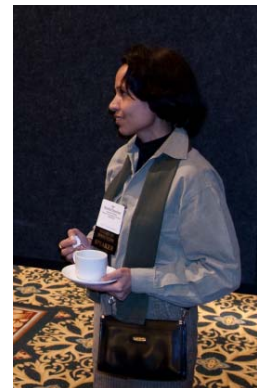
Robert Muratore,
UIA President

Following a refreshment break which was generously sponsored by Moog Medical Device Group, Sunita Chauhan (Nanyang Technological University, Singapore) and Jack Sliwa (St Jude Medical) updated us on their respective applications of HIFU: in the former case, the development of a robotic system for targeted dose delivery in brain surgery, and in the latter, the continuing development and application of ablation techniques for cardiac rhythm disorders.

The final symposium session continued the medical theme, commencing with Jeff Vaitekunas (Ultrapatent), with a detailed description of ultrasonic thrombolysis mechanisms, covering and comparing the wide breadth of commercially-available technologies, and concluding positively about the likely future clinical take-up of the approach. Dave Wuchinich then presented some work on developing a 50 kHz common handpiece, with changeable tips, for carrying out both phaco-emulsification and precision vitrectomy, which has shown considerable promise in-vitro.

Dan Cotter (Integra Lifesciences) then updated us on some of his research (presented initially at the UIA 2007 Symposium in London) in developing ultrasonic surgery devices for brain tumours, where the significant challenges are in the fibrous tissue types encountered.

Aly AlHassan from the University of Toronto presented some intricate work on surgical guidance for spinal surgery: the in-vitro insertion



Sunita Chahan, Nanyang
Technological
University, Singapore

Jeff Vaitekunas, Ultrapatent, compared the wide breadth of commercially-available technologies, concluding positively about future clinical take-up of the approach.

Continued on page 4

2009 Symposium, continued



George Bromfield

of a 3.2 MHz probe inside a pedicle following cannulation during vertebral fusion surgery procedures.

Sonic Concepts' George Keilman then spoke of their work in developing hydrophones and sensors for HIFU applications, varying from surface scanning PZT hydrophones to combined direct pressure/cavitation detection transducers, designed to be robust enough to withstand the hostile acoustic conditions generated in therapeutic fields.

Maintaining the measurement theme, Mark Hodnett from NPL described some proof-of-concept work to design a sensor to measure local ultrasonic intensity directly, based on using the pyroelec-

tric response of a conventional membrane hydrophone when backed with a strongly-attenuating acoustical absorber. Early results suggest subtle differences between



NPL sensor

the data derived from the new sensor, and from conventional techniques in which the pressure values are measured and squared.

The closing presentation of the conference was given by Rasmus LouMoeller from Ferroperm, discussing the development, manufac-

ture and application of porous PZT for transducer applications, in which the ultrasonic material properties may be adjusted to better fit user requirements.

Feedback from delegates has, to date, been very positive indeed, with many folk indicating that the slightly smaller attendance made for a very friendly atmosphere conducive to fruitful discussion. We were also delighted to welcome new exhibitors from across the world to the Symposium, offering prospective customers a range of high value products.

Plan now to attend the 39th UIA Symposium in Cambridge, MA, from April 12-14th 2010.

Do you know of a university with an ultrasound program? Share the UIA Research Award information on page 11 with them. Please let us know by emailing uia@ultrasonics.org with the name of the university and contact information for the chair of the ultrasound program.

2010 Symposium Chairs

Tony Crandall, 2010 Symposium Chair, announces the many individuals who have responsibility for this symposium:

Industrial Session Chair
Leo Klinstein

Medical Session Co-Chairs Dan Cotter and Mark Schafer

Poster Chair Jay Sheehan

Workshop Chair
Mark Hodnett

You may contact any one of the co-chairs noted above by clicking on their name or you may send your inquiry directly to UIA at uia@ultrasonics.org

2010 Invited Speaker Robin Cleveland, Ph.D.

Professor Robin Cleveland carries



out research in the field of physical acoustics with an emphasis on nonlinear acoustic propagation. He uses a combination of experi-

mental measurement, numerical calculation, and theoretical analysis, to study problems such as lithotripsy (breaking of kidney stones by shock waves), high intensity focused ultrasound (HIFU) for therapeutic destruction of tissue, ultrasonic imaging of tissue, and sonic boom propagation in the atmosphere. Professor Cleveland has also worked on aspects of mine detection by acoustics, ultrasound propagation in bone, MEMS based transducers and opto-acoustic transduction. Professor Cleveland's research is carried out at the Physical Acoustics Laboratory at Boston University.

Current projects that Professor Cleveland works on are: shock wave lithotripsy, quantitative ultrasound imaging of HIFU lesions, monitoring and controlling acoustic cavitation. Professor Cleveland is a member of the Gordon Centre for Subsurface Sensing and Imaging Systems (an NSF ERC). He is a fellow of the Acoustical Society of America and Associate Editor of the Journal of the Acoustical Society of America.

Professor Cleveland will be the featured speaker for the medical session on Wednesday, April 12, 2010.

Piezo Institute

Piezoelectric technology is more than 120 years old but the changing nature of society's challenges has driven a surge in new research and applications. The European Commission's recently-formed Piezo Institute aims to harness Europe's expertise to capitalise on the increasing value of piezo technologies.

The Piezo Institute is the hub of European expertise and experience in piezoelectric materials and devices. It was launched in 2008 by the multidisciplinary EC-funded MIND consortium of academic researchers and leading European companies.

In the field of piezoelectric materials and devices, the Piezo Institute is an independent source of:

- Expertise and advice

- Education and training
- Research
- Project management

The institute's expertise includes ferroelectricity, electrostriction, multiferrocity, and pyroelectricity in materials including ceramics, single crystals, polymers and composites.

News


In April one of the Piezo Institute's founder members was awarded the 2009 Verulam Medal by Materials, Minerals & Mining in recognition of distinguished contributions to ceramics.

Prof Markys Cain, materials knowledge leader at the UK's National Physical Laboratory, won the Verulam Medal. It was awarded for his work over the past 12 years in developing the metrology capability

to characterise a new generation of piezoelectric and ferroelectric materials and devices.

In March, the Piezo Institute held its inaugural conference in Zakopane, near the Tatra Mountains in southern Poland. Piezo 2009 brought together academia and industry to discover the latest developments in piezoelectric materials and devices. A diverse range of topics were explored including energy harvesting, thin films and lead-free materials.

The conference programme included presentations and tutorials from international experts in piezoelectric materials and devices. Attendance was similarly cosmopolitan with delegates from all over the globe, including: Europe, US, Canada, South Korea, and Japan



The Piezo Institute is the centre of European expertise and resources in piezoelectric materials and devices. For more information, go to www.pizoinstitute.com

Many times over, your original instinct has proven true.

Attention UIA Members

Do you know of an ultrasonic company that doesn't belong to UIA? Please provide us with the contact information and we'll invite them to join.

Please send us your news. We plan to feature member success stories in future issues of *Vibrations*. Send to uia@ultrasonics.org subject: Member News

“And the hand just rearranges”

Dear UIA member,

This column is dedicated to you. You are keen on science and technology. You worked hard in school, and spent more time there than most of your colleagues. You have attempted to carefully construct your career, but have been forced to adapt to shifting underlying technology and to the high-amplitude oscillations of the marketplace.

You are a recognized leader in ultrasound. You enjoy seeing your ideas become real products. These products help society and gather income. You know more about some important subjects than anyone on the planet, and you enjoy traveling around the world as the expert on these subjects. Sometimes selling your ideas to

your business associates at home is more difficult than selling your ideas abroad.

You are hoping to capitalize on the market recovery. Your plan is to have some new ideas, technologies, and products in the pipeline, but it is difficult to find the resources to properly prepare. Yet you persist, frustrated at the pace of your progress, but quietly pleased with your cleverness.

You think that perhaps the above assessment is too vague, so I offer more specifics. You originally saw the computer as an input-data, process, output-data device. You now see it as your primary source of information. You embrace email, but find little of interest in other social networking aspects such as twittering and

facebooking. You know your way around an oscilloscope. You secretly wish that the high frequency digital scopes were as intuitive to use as the old analog scopes. With each passing year, you rely more on intuition and less on reference to textbooks or first principal derivations. FFTs are second nature to you. Many times over, your original instinct has proven true, that the frequency/time domain duality as applied to wave phenomena is a rich intellectual field. If only it made you monetarily rich! At least you have been able to provide handsomely for your family.

{With thanks to Al Stewart and Scott Adams}

Robert Muratore, Ph.D.

Outstanding Product Award Competition

The 2009 UIA Outstanding Product Award was presented to the National Physical Laboratory, UK, for their development of the cavitation sensor and Cavimeter, bringing to the marketplace a new measurement capability for high power ultrasonic systems.

This award is just the latest of product awards presented by the UIA over the years. This program offers companies the opportunity to feature their

ultrasonic product throughout the ultrasonic community.

This year's program information is found on pages 8 and entry form on page 9. Two categories are available this year: **Outstanding product using ultrasonic energy** and **Outstanding application for existing ultrasonic product**.

The winning entries will be recognized during the 2010 UIA Symposium in Cambridge/

Boston April 2010.

Start thinking now about which product or application your organization can submit for this prestigious award.

Guided tour of MIT and dinner

Celebrate your Tuesday evening in Boston with his evening you will have an up-close and personal tour of the Massachusetts Institute of Technology. The inventions and discoveries sprouting from this university and the alumni coming from it affect each and every one of our lives, each and every day we live! Truly amazing!

Joost Bonsen will be your 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 atmos-

phere. A group with a tag line of "Powering Sound Ideas" will certainly be interested to hear about the 5,000 MIT alumni entrepreneurs, where such startups as iRobot, Analog Devices, Akamai, BOSE, Texas Instruments, and others were started.

Next is dinner at a place of firsts itself as it is 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 you will take an evening stroll accompanied by a professional tour guide that will walk you through historic Faneuil Hall and along the new Rose Kennedy Greenway, ending at the Old State House. This event is **included** in the full symposium registration. But, participation is limited to the first **50** registrations. Be sure to register early to be sure that you're included in this fun event.



Photos courtesy of Eric Schmeidl

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39TH Annual UIA Symposium 12 – 14 April 2010

Royal Sonesta Hotel
Cambridge
Cambridge, MA
USA

UIA Announces Outstanding Product Award

Have you developed a new product that uses ultrasonic energy? Do you have an existing ultrasonic product that has garnered new recognition?

The board of directors of the Ultrasonic Industry Association wants to help gain recognition for outstanding ultrasonic energy products and applications. Here's a way to promote your product or application.

The process is a simple one...

1. Decide which category you want to enter: **Outstanding product using ultrasonic energy** or **Outstanding application for existing ultrasonic product**
2. Complete the entry form and submit to UIA by **31 January 2010**
3. You'll be notified by 28 February, in time to make your plans to attend the 39th UIA Symposium at the Royal Sonesta Hotel, Cambridge, MA.

The fine print...

1. The product / application must be currently marketed.
2. All entry materials submitted to be property of UIA. No materials submitted with the application will be returned.
3. There will be one winner and two runners-up for each category selected.
4. Winners will receive their awards during the symposium at the Royal Sonesta Hotel Cambridge, MA.
5. Applications must be signed by an individual authorized by their company to submit this entry. UIA accepts no responsibility for products or application entries submitted without proper authority.
6. Information on the application may be used in publicity releases to the trade publications or public dissemination without prior notice or additional approval.
7. Winners will receive an award suitable for display.
8. Competition is open to any company, regardless of membership in the UIA.

To submit your application...

Please be sure that you have reviewed your application for complete information, and that the supporting documentation is enclosed.

USPS Address:

UIA
PO Box 2307
Dayton, OH 45401-2307 USA

Courier Address; for UPS, FedEx, etc.:

UIA
11 W Monument Avenue, Suite 510
Dayton, OH 45402 USA

? Call UIA at +1.937.586.3725

 uia@ultrasonics.org

UIA 2010 Outstanding Product & Applications Competition Entry Form

Please complete all sections of this form. With regret, incomplete forms cannot be considered.

Name _____
Job Title _____
Organization _____
Address _____
City State ZIP _____
Country _____
Phone _____ **Fax** _____
E-mail _____
Product or Application Title _____
Category **Product** **Application**

Description *Include a clear, concise session description to be used for evaluation and publicity*

Best Features and Benefits

1 _____
2 _____
3 _____

Why does this product/application deserve to be selected?

Included with this application:

Sales material/specifications **Yes** **No**
Picture **Yes** **No**
Other items (please list) _____

Signature

Your signature denotes that you have been authorized by your company to submit this application.

2010 Call for Papers/Posters

The Ultrasonic Industry Association invites you to submit a 200 word abstract for consideration of presentation or poster on 12 – 14 April at its 39th Annual Symposium in **Cambridge, MA** at the Royal Sonesta Hotel. Plan now to join UIA for this international conference featuring the best of ultrasound from around the world. For more information, please go to <http://www.ultrasonics.org>

Please check the appropriate category and preferred format of your proposed presentation:

Industrial Applications: NDE, Measurements, Cleaning, Atomization, Materials Processing, Effluent Processing, Joining and Fastening, Welding and Cutting, Sonochemistry, Underwater Applications, Remote Sensing, Transducer Design/ Materials.

Medical: Surgical, Therapeutic, HIFU/LIFU, Bioeffects, Tissue Characterization, Bio-Acoustic Microscopy, Transducer Design/Materials

Paper Presentation **Poster Session**

Please print clearly

Presentation Title _____

Authors _____

Presenters _____

Main Contact Name _____

Address _____

City _____

State/Province _____

Postal code _____

Phone _____

Fax _____

E-mail _____

Deadline: 31 August 2009

Important Information: Papers will be no longer than 25 minutes; final abstracts must be submitted via e-mail or disc and bio-sketches and **full papers** must be submitted to the UIA office no later than **15 February 2010**. The session chair will contact you directly to discuss your proposed presentation. **Accepted presenters receive a discounted registration fee.**

Symposium Chairs

Symposium: Tony Crandall ▲ +1. 801 264.1001 ▲ Fax: +1. 801 264.1051 ▲ tcrandall@moog.com
 Medical Co-Chairs: Dan Cotter ▲ +1. 781 565.1229 ▲ daniel.cotter@Integra-ls.com
 Mark Schaffer ▲ +1. 212 641.4909 ▲ +1 215.641.9254 ▲ marks@sonictech.com
 Industrial Chair: Leo Klinstein ▲ +1. 630 797.4950 ▲ lklinstein@dukcorp.com
 Poster Chair: Jay Sheehan ▲ +1. 781 799.2059 ▲ james_sheehan@comcast.net

Please submit this form (preferably electronically) or via fax to:

**Ultrasonic Industry Association ☎ PO Box 2307 ☎ Dayton, OH 45401-2307 ☎ USA
 Voice +1.937.586.3725 ☎ Fax +1.937.586.3699 ☎ E-mail uia@ultrasonics.org ☎ Web www.ultrasonics.org**



39TH Annual UIA Symposium 12-14 April 2010

Royal Sonesta Hotel
Cambridge

Cambridge, MA USA

Graduate Research Award Deadline 31 January 2010

The Ultrasonic Industry Association (UIA) is pleased to announce its Graduate Research Award will be presented at the 39th UIA Symposium at the Royal Sonesta Hotel Cambridge. This Graduate Research Award recognizes excellence in graduate studies in the science and technologies of interest to the Ultrasonic Industry Association.

The award consists of a **\$1,000 cash prize and commemorative plaque.**

Eligibility

- ≥ Applicant must be a full-time graduate student in an academic institution.
- ≥ Applicant research topic must be in the field of ultrasonic applications (e.g. cleaning, sonochemistry, welding, medical, etc.)
- ≥ Applicant must be working on a research dissertation at the MS or PhD level.

How to Enter

Send the following information to UIA via email: uia@ultrasonics.org

- ≥ Title page which includes:
 1. Your name
 2. Topic or Title of Paper
 3. Complete mailing address
 4. Telephone, fax and e-mail information
- ≥ Complete copy of paper, which should be based on your thesis work
- ≥ Information sheet to include the course of study, school, advisor, sponsor, years in graduate school, papers presented, etc (maximum 3 pages)
- ≥ Official university transcript or letter of support from Department Chair
- ≥ Other supporting information (maximum 5 pages)

Criteria

The criteria for evaluating the Graduate Research Award will be based on several factors, including whether the research was hypothesis-driven, the supportive preliminary data, and the simulation and/or experimental test results. An assessment will be made as to the general impact of the research on the medical or industrial field - whether the results of the research improved the visualization and understanding of a specific problem or have the potential to lead to a larger-scale research project.

Announcement

The award recipient will be notified by 20 February 2010. The award will be made at the 39th UIA Annual Symposium at the Royal Sonesta Hotel Cambridge during the symposium, 12 - 14 April 2010. The recipient will be invited to present his/her paper at the symposium. The winner may also invite up to two significant family members.

Send applications to: **Ultrasonic Industry Association**
11 W Monument Ave. Ste 510 ≥ Dayton, OH 45402

+1.937.586.3725 uia@ultrasonics.org www.ultrasonics.org