Volume 33 Issue 1: 2024 Winter 2024

ultrasonic industry association
UIA
powering sound ideas

Vibrations

Powering Sound Ideas

UIA52 Program Complete: 8 - 10 April 2024 in Dublin, Ireland

The UIA is looking forward to an engaging symposium chaired by Andrew Feeney, UIA52 Symposium Chair.

UIA52 provides a balanced program of medical and industrial presentations from experts in ultrasound from throughout Europe, UK, and the US. UIA offers the crossroads of manufacturing, research and academia that provides for in-depth discussion about the current and future applications of ultrasound.

In addition to the Keynote Speakers featured below, UIA52 offers in-depth presentations, **detailed on page 5.**

Our Tuesday session features workshops on "Developing ultrasonic transducers for novel intravascular surgical procedures" and "UltraSurge: Surgery enabled by Ultrasonics", as well as a demonstration by Stryker.

Please click here for up-to-date information about UIA52.

Inside this issue:

UIA52: Featured Speakers

Mark E. Schafer, Ph.D. Fellow, ASA, AIUM, AIMBE
Sonic Tech, Inc.

See page 4

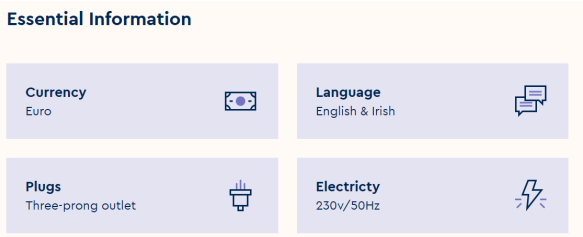
Andrew Abbott, Professor of Physical Chemistry, University of Leicester

Professor Abbott's principal expertise is in green chemistry, where he established the field of deep eutectic solvents, now a significant discipline represented by thousands of research papers in the scientific literature. His specific research interests are in the processing of materials, and he has several significant collaborations with industry, including in the development of novel solvent

Continue reading on page four about our featured speakers and programs for UIA52

Traveling to Ireland

Getting to Dublin is a breeze. Dublin Airport is one of the busiest in Europe, with hundreds of daily flights providing a huge range of options to get here. Direct flights are available from most major cities in the UK and continental Europe, several hubs in North America, and the Gulf cities of Dubai and Abu Dhabi. Connecting hubs hook up with further flights from all over the world, providing for easy access to the Irish capital.



Starting in 2025, U.S. passport holders traveling to Europe will need to apply for authorization through the European Travel Information and Authorization System (ETIAS) before their visit.

The new rules were set to go into effect in 2024, but E.U. officials announced in October the rollout would be delayed until the following year.

Hyatt Centric The Liberties, Dublin, Ireland

This convenient location makes for the perfect Dublin City Centre hotel for exploring many of the area's top attractions, uncovering history dating back centuries, and everything in-between. All that you need for a great stay and excellent 4-star hotel experience is here at Hyatt Centric The Liberties Dublin in one of the oldest parts of Dublin.

Click here to make your hotel reservations at the special UIA rate

Our hotel is your starting point in the heart of Dublin. From local shops and designer stores to Dublin's #1 tourist attraction, Guiness Storehouse, Dublin offers a wide array of activities to explore during your stay at Hyatt Centric The Liberties Dublin. Step off the beaten path to discover local distilleries, walks along an 18th century sea wall, and one of Ireland's greatest cultural treasures—the Book of Kells at Trinity College Dublin.

Tuesday Evening : Dublin Liberties Distillery

This event is included in your Symposium registration; extra tickets for guests are available.

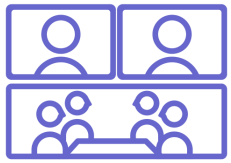
UIA52 is Multi-Access

Based on the success with offering UIA51 to virtual participants as well as those able to join in person, UIA is committed to a multi-access program.

The program will be scheduled according to the time in Dublin. However, all sessions will be available via live-streaming and then for on-demand viewing for all UIA52 participants.

Virtual participants will have access to all the presentations, including keynote speakers, industrial and medical session presentations, and the focused speakers on Tuesday morning. The question/answer sessions will be open to the virtual participants to ask their questions.

Poster presenters will be able to give a brief overview of their posters as well as having their poster and supporting data available online for symposium participants.



Created by Nicole Marie from Noun Project

UIA52 Registration is OPEN!

LIVE REGISTRATION FEES:

Members
$850

Nonmembers
$999

Students $495

Poster Presenters
$199 (includes Tuesday and your choice of either Monday or Wednesday at no additional charge

Daily registration - Members
$425

Daily registration - Non-members
$599

VIRTUAL REGISTRATION FEES:

Members $650
Nonmembers $850

Daily - members $299
Daily - nonmembers $499
Students Full - $495
Students Daily - $199

Register NOW!

"The best part of a UIA conference is the ability to have access to the presentation slides for future reference, which is not commonly done anywhere else."

Here's what our Symposium participants have to say...

" It was really great to connect with industrial based research rather than academic to understand their research development and issues."

"UIA51 proved to be very helpful this year. 3 or 4 papers exhibited technology that was really relevant to our research and development efforts."

UIA52 Invited Speakers and more

systems for industrial applications such as metal deposition and dissolution. A significant proportion of his research to date has focused on the development of novel processes using ionic liquids, targeting delamination and processing of a wide range of materials and substrates, for example in recycling technologies for electronic waste. He is currently a partner in the Faraday Institution project ReLiB (Recycling and Reuse of EV Lithium-ion Batteries) with the University of Birmingham, where he has led his team to innovate a new process for delaminating battery materials which is being scaled up for use at battery manufacturing plants in the UK. Among many other projects, he also leads the SonoCat project in partnership with the University of Glasgow, focusing on the recovery of technology critical metals from electronic waste and photovoltaic cells using a combination of targeted ultrasonics with catalytic etchants. Professor Abbott holds eleven patents, and in recognition of his achievements, he was awarded the Royal Society of Chemistry Green Chemistry and Industrial Chemistry medals.

Dr Schafer is Research Professor in the School of Biomedical Engineering, Science and Health Systems Drexel University. He has extensive expertise in the development of ultrasound systems for medical applications, including combined ultrasound and therapeutic light sources for antibacterial treatment, as well as neurological applications of ultrasound. His significant experience encompasses diagnostic, therapeutic, and surgical ultrasound, in addition to devices for lithotripsy, from their initial design, through the development and testing phases in conjunction with the necessary regulatory submissions and intellectual property protection. Dr Schafer therefore has significant experience of the current standards in ultrasound technology for medical procedures, and he is at the forefront of innovations relating to ultrasonic devices for medical applications. Dr Schafer is the Principal Investigator on an interdisciplinary Pennsylvania Commonwealth Universal Research Enhancement (CURE) grant. In this research, he is collaborating with fellow Drexel University academics Dr Margaret Finley, Associate Professor in Physical Therapy and Rehabilitation Sciences in the College of Nursing and Health Professions, and Dr Peter Lewin, the Richard B. Beard Distinguished University Professor in the School of Biomedical Engineering, Science and Health Systems. Dr Schafer will be focusing his keynote presentation on the use of ultrasound for neural stimulation, including some at very small dimensions!

The Showcase Session

UIA is presenting a new format for the middle day of the symposium this year, called the Showcase Session, where we will be focusing on a series of demonstrations at the symposium venue. This exhibition will include a showcase of technology developments from the UK Sustainable Manufacturing community, including perspectives on design for recycling, reuse, and industrial upscaling. This research is a bridge between different scientific and engineering disciplines, including ultrasonics, electronics, chemistry, and materials science. There will also be an exhibition of the latest research in surgery enabled by ultrasonics, including developments from the multi-institutional UK UltraSurge research programme, led by UIA President Professor Margaret Lucas. There will also be demonstrations from industry organisations showcasing the latest technology developments. Within this programme of events, there will be a poster presentation session featuring the latest research from ultrasonic doctoral students and postdoctoral researchers. This poster presentation session will encompass many aspects of ultrasonics, from industrial to medical, experimental, and theoretical.

MEET IN IRELAND

There will be some free time in the afternoon for participants to visit one or more of the breweries and distilleries within easy walking distance of our hotel.

Our Tuesday evening social event is a tour at the Dublin Liberties Distilleries, whiskey tasting and dinner.

Fáilte Ireland
National Tourism Development Authority

UIA52 Presentations

Medical Sessions - Monday, 8 April 2024

Additively manufactured ultrasonic osteotomy inserts for improved temperature,
Dr Martin Hofmann, ***University of Bern***
Ultrasound-enhanced fine-needle aspiration biopsy — from device development to first clinical experience,
Dr Heikke Nieminen, ***Aalto University***
In vitro ultrasonic treatment of endothelial cells, *Lisa Shriane,* ***University of Birmingham***
Using digital image correlation ultrasonically assisted orthogonal cutting,
Dr. Dong Wang, ***University of Exeter***
Practical design of a miniaturised half-wave ultrasonic transducer for soft-tissue dissection,
Alexandr Kiyashko, ***Nami Surgical***
Miniaturised FUS transducer for automated robotic delivery, *Jack Stevenson,* ***University of Glasgow***
Keynote: Designing ultrasound systems for brain research across different spatial scales,
Dr. Mark Schafer, ***Drexel University***
Comparative study: Ultrasound imaging texture analysis vs. force and pressure,
Ashraf Agweder, ***University of Dundee***
Neuromodulation, *Dr Ali Rezai,* ***West Virginia University***
An accurate needle tip detecting method for ultrasound-guided regional anaesthesia at various driving voltages and insertion angles, *Ashraf Agweder,* ***University of Dundee***

Industrial Sessions - Wednesday, 10 April 2024

Material properties of hard piezoelectric ceramics at cryogenic temperatures,
Dr Sebastian Schlack, ***PI Ceramic***
Understanding the dynamics of Langevin transducers incorporating nitinol,
Yuchen Liu, ***University of Glasgow***
Optimizing the phase window of ultrasonic transducers,
Dr Dominick DeAngelis, ***Kulicke and Soffa Industries***
Stereolithography for additively manufactured flexural ultrasonic transducers,
Dr. Alex Hamilton, ***University of Glasgow***
Piezoceramic tube transducers and flow-based sonoprocessing,
Paul Daly, ***University of Glasgow***
On the matter of acoustic softening, *Dr. Karl Graff, EWI*
Keynote: Ultrasonic delamination of technology critical metals from e-waste using catalytic etchants, Professor *Andrew Abbott,* ***University of Leicester***
Acoustic cavitation enhanced delamination of technology critical metals from printed circuit boards in a deep eutectic solvent, *Dr. Ben Jacobson,* ***University of Glasgow***
Selective bubble detection in a multi-phase flow, using non-linear acoustics,
Hannes Emmerich, **TU Dresden**

Tuesday Workshops / Posters / Exhibits, 9 April 2024

Developing ultrasonic transducers for novel intravascular surgical procedures, *Liam Dillon,* ***Ceramtec UK***
UltraSurge: Surgery enabled by ultrasonics, *Prof. Margaret Lucas,* ***University of Glasgow***
Stryker; Technology presentation

The following presentations are currently scheduled. The program is subject to change.

Ultrasound in the News

The research of the KTU team revealed that the ultrasound's impact on blood parameters is not limited to the platelet count – it also affects red blood cells (RBC), which can result in better oxygen circulation and lowered blood pressure.

Low-frequency ultrasound can improve oxygen saturation in blood

Research conducted by a team of scientists from Kaunas universities, Lithuania, revealed that low-frequency ultrasound influences blood parameters. The findings suggest that ultrasound's effect on haemoglobin can improve oxygen's transfer from the lungs to bodily tissues.

The research was undertaken on 300 blood samples collected from 42 pulmonary patients.

The samples were exposed to six different low-frequency ultrasound modes at the Institute of Mechatronics of Kaunas University of Technology (KTU).

The changes in 20 blood parameters were registered using the blood analysing equipment at the laboratories of the Lithuanian University of Health Sciences (LSMU). For the prediction of ultrasound exposure, artificial intelligence, i.e. analysis of variance (ANOVA), non-parametric Kruskal-Wallis method and machine learning algorithms were applied.

The calculations were made at the KTU Artificial Intelligence Centre.

The use of non-pharmaceutical treatment improves oxygen circulation and reduces blood pressure

KTU professors Vytautas Ostasevicius and Vytautas Jurenas say that the ongoing research papers are related to blood platelet aggregation.

"This means that low-frequency ultrasound can be potentially used for improving oxygen saturation in lungs for pulmonary hypertension patients. Keeping in mind the recent COVID-19 pandemic, we see a huge potential in exploring the possibilities of our technology further," says Prof Ostasevicius.

The research of the KTU team revealed that the ultrasound's impact on blood parameters is not limited to the platelet count -- it also affects red blood cells (RBC), which can result in better oxygen circulation and lowered blood pressure.

"During exposure to low-frequency ultrasound, aggregated RBCs are dissociated into single RBCs, whose haemoglobin molecules interact with oxygen over the entire surface area of RBCs, which is larger than that of aggregated RBCs and improves oxygen saturation in blood. The number of dissociated single RBCs per unit volume of blood decreases due to the spaces between them, compared to aggregates, which reduces blood viscosity and affects blood pressure," explains Prof Ostasevicius, the Head of KTU Institute of Mechatronics.

The scientists claim that the effect of ultrasound on the haemoglobin in RBCs was higher than its impact on platelet aggregation, which is responsible for blood clotting.

Their findings have been supported by an additional analysis made at the LSMU Laboratory of Molecular Cardiology.

Continued on the next page

Ultrasound in the News, continued

"This means that low-frequency ultrasound can be potentially used for improving oxygen saturation in lungs for pulmonary hypertension patients. Keeping in mind the recent COVID-19 pandemic, we see a huge potential in exploring the possibilities of our technology further," says Prof Ostasevicius.

Partnership between medical and engineering scientists

In medicine, high-frequency ultrasound from 2 to 12 MHz is used for both diagnostic and therapeutic purposes.

"Acoustic waves emitted by high-frequency ultrasound have a limited penetration depth into the body, so external tissues are more affected by high-frequency ultrasound than internal organs. Low-frequency ultrasound acoustic waves, penetrate deeper into the internal organs with a more uniform sound pressure distribution," explains Prof Jurenas.

There are numerous applications for ultrasound in medical settings.

"For example, focused ultrasonic waves are used to break kidney stones, and to kill cancer cells. Maybe ultrasound can be used to activate certain medications. Or, to alleviate the delivery of antibiotics to the inflamed areas?" says Prof Jurenas.

The technology used in the above-described study is only one illustration of many successful working partnerships between engineers and physicians.

For example, just recently, the researchers of KTU Institute of Mechatronics have created the frame for immobilising the Gamma Knife radiosurgery patients at the Clinics of the Lithuanian University of Health Sciences.

"We believe, that using the know-how of different areas one can achieve greater results," say KTU researchers about interinstitutional and interdisciplinary cooperation.

https://www.sciencedaily.com/releases/ 2024/01/240122120139.htm

Scientist shows focused ultrasound can reach deep into the brain to relieve pain

You feel a pain, so you pop a couple of ibuprofen or acetaminophen. If the pain is severe or chronic, you might be prescribed something stronger -- an opioid pain killer that can be addictive under some circumstances.

But what if you could ease pain by non-invasively manipulating a spot inside your brain where pain is registered?

Soundwaves from low-intensity focused ultrasound aimed at a place deep in the brain called the insula can reduce both the perception of pain and other effects of pain, such as heart rate changes.

A new study by Wynn Legon, assistant professor at the Fralin Biomedical Research Institute at VTC, and his team points to that possibility.

The study, published in the journal PAIN on Monday, Feb 5, found soundwaves from low-intensity focused ultrasound aimed at a place deep in the brain called the insula can reduce both the perception of pain and other effects of pain, such as heart rate changes.

"This is a proof-of-principle study," Legon said. "Can we get the focused ultrasound energy to that part of the brain, and does it do anything? Does it change the body's reaction to a painful stimulus to reduce your perception of pain?"

Focused ultrasound uses the same technology used to view a baby in the womb, but it delivers a narrow band of sound waves to a tiny point.

At high intensity, ultrasound can ablate tissue. At low-intensity, it

Continued on the next page

Ultrasound in the News, continued

can cause gentler, transient biological effects, such as altering nerve cell electrical activity

Neuroscientists have long studied how non-surgical techniques, such as transcranial magnetic stimulation, might be used to treat depression and other issues.

Legon's study, however, is the first to target the insula and show that focused ultrasound can reach deep into the brain to ease pain.

The study involved 23 healthy human participants. Heat was applied to the backs of their hands to induce pain.

At the same time, they wore a device that delivered focused ultrasound waves to a spot in their brain guided by magnetic resonance imaging (MRI).

Participants rated their pain perception in each application on a scale of zero to nine.

Researchers also monitored each participant's heart rate and heart rate variability -- the irregularity of the time between heart beats -- as a means to discern how ultrasound to the brain also affects the body's reaction to a painful stimulus.

Participants reported an average reduction in pain of three-fourths of a point.

"That might seem like a small amount, but once you get to a full point, it verges on being clinically meaningful," said Legon, also an assistant professor in the School of Neuroscience in Virginia Tech's College of Science.

"It could make a significant difference in quality of life, or being able to manage chronic pain with over-the-counter medicines instead of prescription opioids."

> "The study also found the ultrasound application reduced physical responses to the stress of pain"

The study also found the ultrasound application reduced physical responses to the stress of pain -- heart rate and heart rate variability, which are associated with better overall health.

"Your heart is not a metronome. The time between your heart beats is irregular, and that's a good thing," Legon said.

"Increasing the body's ability to deal with and respond to pain may be an important means of reducing disease burden."

The effect of focused ultrasound on those factors suggests a future direction for the Legon lab's research -- to explore the heart-brain axis, or how the heart and brain influence each other, and whether pain can be mitigated by reducing its cardiovascular stress effects.

Other authors on the paper include Andrew Strohman, an M.D.+Ph.D. student in the Virginia Tech Carilion School of Medicine and Virginia Tech's Translational Biology, Medicine, and Health program, and other Legon Lab members.

The study was supported by the Seale Innovation Fund, the Focused Ultrasound Foundation, and the National Institutes of Health.
https://www.sciencedaily.com/releases/2024/02/240205165844.htm

Network of robots can successfully monitor pipes using acoustic wave sensors

An inspection design method and procedure by which mobile robots can inspect large pipe structures has been demonstrated with the successful inspection of multiple defects on a three-meter long steel pipe using guided acoustic wave sensors.

The University of Bristol team, led by Professor Bruce Drinkwater and Professor Anthony Croxford, developed approach was used to review a long steel pipe with multiple defects, including circular

Ultrasound in the News, continued

holes with different sizes, a crack-like defect and pits, through a designed inspection path to achieve 100% detection coverage for a defined reference defect.

In the study, published in NDT and E International, they show how they were able to effectively examine large plate-like structures using a network of independent robots, each carrying sensors capable of both sending and receiving guided acoustic waves, working in pulse-echo mode.

This approach has the major advantage of minimizing communication between robots, requires no synchronization and raises the possibility of on-board processing to lower data transfer costs and hence reducing overall inspection expenses.

The inspection was divided into a defect detection and a defect localization stage.

Lead author Dr Jie Zhang explained: "There are many robotic systems with integrated ultrasound sensors used for automated inspection of pipelines from their inside to allow the pipeline operator to perform required inspections without stopping the flow of product in the pipeline. However, available systems struggle to cope with varying pipe cross-sections or network complexity, inevitably leading to pipeline disruption during inspection. This makes them suitable for specific inspections of high value assets, such as oil and gas pipelines, but not generally applicable.

"As the cost of mobile robots has reduced over recent years, it is increasingly possible to deploy multiple robots for a large area inspection. We take the existence of small inspection robots as its starting point, and explore how they can be used for generic monitoring of a structure. This requires inspection strategies, methodologies and assessment procedures that can be integrated with the mobile robots for accurate defect detection and localization that is low cost and efficient.

"We investigate this problem by considering a network of robots, each with a single omnidirectional guided acoustic wave transducer. This configuration is considered as it is arguably the simplest, with good potential for integration in a low cost platform."

The methods employed are generally applicable to other related scenarios and allow the impact of any detection or localization method decisions to be quickly quantified.

The methods could be used across other materials, pipe geometries, noise levels or guided wave modes, allowing the full range of sensor performance parameters, defects sizes and types and operating modalities to be explored.

Also the techniques can be used to assess the detection and localization performance for specified inspection parameters, for example, predict the minimum detectable defect under a specified probability of detection and probability of false alarm.

The team will now investigate collaboration opportunities with industries to advance current prototypes for actual pipe inspections. This work is funded by the UK's Engineering and Physical Sciences Research Council (EPSRC) as a part of the Pipebots project.

https://www.sciencedaily.com/releases/2023/11/231129003937.htm

One more article of interest...

Pushing the boundaries of ultrasound imaging: Breaking new ground with ultrafast technology

From the President

Margaret Lucas

UIA President

We are looking forward to our UIA Symposium in Dublin in April. There is a fantastic programme coming together with our usual schedule of a one-day medical session and a one-day industrial session sandwiching a middle day of workshops, showcases, posters and discussions.

Mark Schafer's medical keynote lecture is on ultrasound systems for brain research where he will explore the nature of ultrasound interaction with neural tissues, presenting experiments on fruit flies and rodents, and discussing the challenges of ultrasound exposure in the human brain. Mark is an entrepreneur, consultant, and business leader as well as a Research Professor in the School of Biomedical Engineering, Science, and Health Systems at Drexel University, USA.

Our industrial keynote speaker is Andrew Abbott, Professor of Physical Chemistry at the University of Leicester, UK. He will talk about his research on the recovery of technology critical metals from electronic waste and photovoltaic cells using a combination of targeted ultrasonics and catalytic etchants, part of his growing research portfolio in green chemistry.

With a full 3 days of great ultrasonics talks and workshops, we will welcome our Tuesday evening event of a whiskey tasting and dinner at The Dublin Liberties.

We would all like to thank Dr Andrew Feeney again for putting together an amazing symposium. We are only sad that he can't join us in Dublin this year due to the imminent arrival of his second child – but we wish him and his family all the best.

UIA Board

Ultrasonic Industry Association
11 W Monument Ave, Ste 510
Dayton OH USA

Phone: +1.937.586.3725
uia@ultrasonics.org

ultrasonic industry association
UIA
powering sound ideas

VISIT US AT
ULTRASONICS.ORG

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.*

Let's work together to power your sound ideas. Contact a member consultant or company through our online Referral Network, learn about ultrasonics with our online primer, or meet industry leaders at our next symposium.

Important Dates

UIA 52
powering sound ideas
8 - 10 April 2024
Hyatt Centric, Dublin, Ireland

8 - 10 April 2024: UIA52, Hyatt Centric The Liberties, Dublin, Ireland

6 - 9 May 2024: 2024 Int'l Workshop on Acoustic Transduction Materials and Devices, Penn State

20 June, 2024: Virtual Collaborations