Volume 32 Issue 2: 2023 Summer 2023

ultrasonic industry association
UIA
powering sound ideas

Vibrations

Powering Sound Ideas

UIA52: 8 - 10 April 2024 in Dublin, Ireland

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

UIA52 will provide 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.

Abstract Submission

UIA welcomes abstracts for consideration for medical or industrial ultrasonic applications.

Deadline: 19 January, 2024

Workshop Presentations

If you have an idea about an hour-long presentation on the fundamentals of ultrasound, please contact Andrew Feeney directly.

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

Submit your abstracts here

Inside this issue:

UIA51: 24–26 April 2023 in Utrecht, The Netherlands

This part of the UIA 5ymposium Review is by Justin Byers

The 51st Ultrasonic Industry Association (UIA) Symposium kicked off with a tour of the UMC Utrecht ultrasound labs. Participants had the unique opportunity to explore this HIFU Center of Excellence, gaining valuable insights into its clinical and commercial partnerships.

The lab tour focused on High-Intensity Focused Ultrasound (HIFU), a technology currently undergoing clinical evaluation and moving towards reimbursement at this facility. The tour delved into the potential applications of HIFU, including pain palliation for bone metastases, uterine fibroids, desmoid tumors, and various treatments related to the prostate, immune therapy, and the blood-brain barrier.

The lab tour also included a demonstration of MRI Guided HIFU, utilizing a 256 and 1024 element array transducers. The process involved raising the temperature of the

Continued on page 4

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.

Essential Information

Currency Euro	**Language** English & Irish
Plugs Three-prong outlet	**Electricty** 230v/50Hz

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, The Liberties.

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.

Make your hotel reservations

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 Dub;in. However, all sessions will be available on Zoom 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.

UIA52 Registration is OPEN!

LIVE REGISTRATION FEES:

Members
Before 1 February $650

Nonmembers
Before 1 February $850

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.

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.

UIA51 Program Review - Monday

target area to 55 degrees Celsius for a few seconds to achieve tissue ablation.

In addition to HIFU ablation, the lab tour explored other applications such as the removal of biofilms from implants and potential uses in neurologic and breast tissue treatments. These discussions provided valuable insights into the expanding scope of HIFU technology across various medical domains.

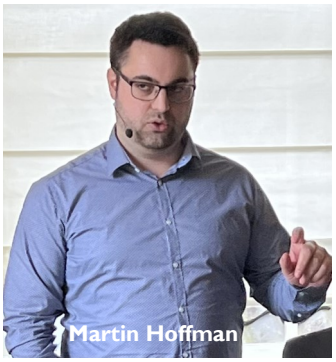
After the morning tour, the UIA51 Symposium officially commenced with a welcome from Dr. Dominick A. DeAngelis, UIA

President, and **Dr. Andrew Feeney**, Symposium Chair. The event brought together both in-person and virtual attendees, setting the stage for a day filled with presentations and discussions.

Dr. Heikki Niemenen from Aal-

to University delivered a presentation titled "How Flexurally Oscillating Ultrasonic Needles Could Revolutionize Healthcare?" Dr. Niemenen shed light on the longstanding design of hypodermic needles, which has remained mostly unchanged since their introduction in 1853, and explored the potential of leveraging nonlinear acoustic phenomena to enhance this technology. Notably, he discussed the transformative potential of the Sonolancet, a needle design utilizing ultrasound technology to significantly improve tissue yield by 3x - 6x in fine needle aspiration biopsy procedures.

Next, **Martin Hofmann** from The University of Bern presented on novel approaches using planar piezoelectric ultrasonic transducers for effective periodontal scaling and care. Hofmann emphasized that dental calculus, the calcified form of dental plaque, poses a significant challenge in maintaining oral



health. The speaker presented a comprehensive comparison of different techniques for periodontal scaling, including hand scaling, ultrasonic scaling, and air polishing. Among these, ultrasonic scaling stood out for its promising outcomes, achieving a log 3 reduction in oral bacterial biofilms.

Dr. Sebastian Schlack from PI Ceramic GmbH delivered an insightful presentation on highly flexible polyurethane-based PZT

Continued on the next page

UIA51 Program Overview, - Monday continued

composites, highlighting their advantages in ultrasonic applications. The adaptability and versatility of these composites, along with their resonant frequencies ranging from 91 kHz to 13.7 MHz, showcased their potential for diverse applications in the ultrasonic industry. Dr. Schlack further discussed the importance of flexibility in ultrasonic systems, particularly in cases involving uneven surfaces and focusing requirements.

Dr. **Koen van Dongen**, representing TU Delft, delivered an enlightening keynote presentation on the history, advancements, and potential applications of imaging in medical ultrasound. The presentation began with a historical overview, tracing the origins of ultrasound from animals' ability to utilize it for echolocation to the development of piezo materials and transducers. Dr. van Dongen highlighted the history of ultrasonic imaging and its parallel use in seismic mapping, noting that seismic ultrasound technology is approximately 1-2 decades ahead of its medical counterpart.

Dr. van Dongen discussed breast ultrasound introduced as an alternative to mammography. Current research suggests that lower-frequency breast ultrasound, akin to the frequencies employed in the seismic community, shows promise in this domain. The speaker delved into the technical aspects, presenting acoustic wave equations and the use of synthetic data for modeling. Various techniques such as inverse Radon and parabolic approximation, synthetic aperture focusing technique, acoustic wave inverse equations, nonlinear inversion, frequency

vs. time domain, and multiparameter inversion were discussed in detail.

Furthermore, Dr. van Dongen explored the integration of machine learning in tissue classification and inversion processes. The potential for leveraging machine learning algorithms in ultrasound-based tissue characterization and inversion was a significant focus of the presentation.

Olga Yevlashevskaya from the University of Birmingham presented a novel ultrasonic device designed for studying cells on titanium surfaces in vitro. Her research focused on addressing issues related to delayed or incomplete bone healing, offering insights into the effects of ultrasound on bone healing processes and potential therapeutic interventions.

Yevlashevskaya emphasized the need for effective solutions in this area and discussed the current state of research on Low-Intensity Pulsed Ultrasound (LIPUS), which has yielded positive but inconclusive data. The presentation focused on in vitro research aiming to establish standardized testing for bone healing. Yevlashevskaya compared different in vitro sonication systems and shared details about the experimental setup.

This part of the UIA 5ymposium Review is by Justin Byers.
The review continues on the following page

UIA51 Program Review - Tuesday Insights

Manufacturing Challenges

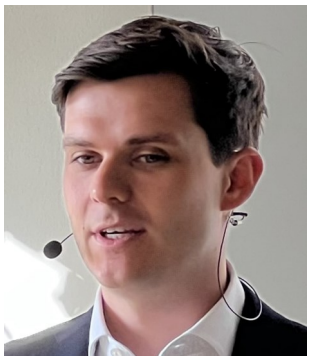
LEO KLINSTEIN, Dukane

Design Challenges & Solutions

The design requirements for 500 mm wide food cutting blades include uniform amplitude output and the "tuning out" of parasitic frequencies. In addition to an even amplitude distribution and lack of parasitic frequencies, sealing bars require a high-power draw for effective operation. Solutions include iterative design optimization using Finite Element Analysis, implementation of novel structures and support features integral to the horn.

For high power ultrasonic systems, the coexistence of high and low voltage circuitry is a serious design challenge. Product ease of use necessitates "smart" user friendly designs that include quick, end-effector connectivity and intuitive setup.

Product use, transportation and storage environments affect



CHARLES DOWLING, Ceram Tec

product performance and lifetime and therefore must be taken into consideration as design inputs.

Software development has to consider compatibility with various mainstream platforms such as Windows, at different release levels.

Supply Chain Challenges and Solutions

Scarcity of raw materials can drive up manufacturing costs and affect the ability to build products. Aluminum sock sizes, not readily available. The lead time for Titanium alloy is greater than six months. Materials procured from alternate suppliers must be evaluated for variations in acoustic properties that could lead to design changes resolved with the help of FEA tools. The manufacturing of ceramics is affected by the volatility of the minerals market and the scarcity of key raw materials such as Bismuth and Titanium Dioxide. The semiconductor market was one of the most challenging in the last couple of years. Due to extreme scarcity, the cost of a $12 microcontrollers could go as high as $600.

Mitigations include keeping substantially higher inventory levels of raw materials such as ceramics and Titanium, dual sourcing through the qualification of alternate suppliers, specification of standard material sizes. Designs using readily available electronic components are highly desired as the use the sourcing and use of replacement parts may lead to costly and lengthy product recertifications. Worth doing extra diligence on exotic materials as they may lead to single source supplier situations such as Victrex, the manufacturer of PEEK polymers.

Manufacturing Challenges and Solutions

The difficulties associated with creating reliable no lead solder joints in transducer manufacturing are mitigated by the use of crimped electrical connections.

Stabilization processes for piezo ceramics: lead-free material is being pre-aged through an annealing process. The natural aging of PZTs is difficult to substi-

Continued on the next page

UIA51 Program Overview, continued

tute with accelerated aging processes. Fully assembled transducers may be aged through controlled operation over a specific time interval. This approach, however, presents an economic challenge resulting from the cost of test stations that would make such process time effective. Experience with piezo-based sensor manufacturing shows that annealing is very beneficial for the stability of the device.

Product Maintenance Challenges

The requirement for on-site recalibration of ultrasonic equipment used for the manufacturing of medical products is mitigated by on-board force-pickup and data processing algorithms. Off the shelf equipment is either not available, for high power calibration or very expensive, for amplitude calibration using laser vibrometers; hence the need for creative design solutions that involve multiple, software controlled, self-diagnostic tests that also facilitate remote troubleshooting.

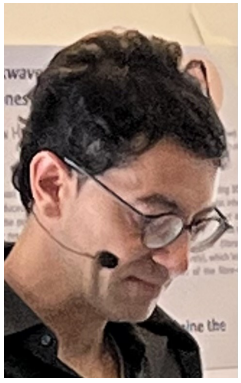
This part of the UIA 5ymposium Review is by Dan Voic

The industrial session for UIA51 kicked-off on Wednesday this year with a presentation by outgoing UIA

President **Dominick DeAngelis** from Kulicke & Soffa Industries on "Quantifying Power of Ultrasonic Transducers." Dominick presented some practical methodologies on scaling the size ultrasonic transducers for power applications such as metal welding, which is scant in the literature.

The second speaker was Gianni Ferrero from CTS Corporation with a presentation on "Lead-Free Piezoelectric Ceramics: Addressing Industry-Relevant Challenges." Gianni provided a nice summary quantifying the problems that lead-free piezoceramic manufactures such as CTS are facing for scaling their lead-free materials to mass production.

Power ultrasonic consultant, **Andrea Cardoni** (a.k.a., "The Stella"),



shared the underlying details of his recent design projects with a presentation on the "Advances in the Design of Ultrasonic Systems for Process Intensification." Andrea also provided practical guidelines for implementing and scaling fluid processing technology.

Mahshid Hafezi from the University of Glasgow discussed her recent research on "Nitinol's Tribological Characteristics for Adaptive Ultrasonic Devices." Mahshid described the potential novel use of Nitinol in ultrasonic transducers by exploiting its adaptive properties for joint "healing," which is a material not widely used in ultrasonic transducers.

UIA51 Program Review - Tuesday Insights

Abdul Hadi Chibli from the University of Glasgow discussed his recent research in "Comparing Generation III Relaxor-PT Single Crystal with Modified PZT-4 and PZT-8 for Power Ultrasonics Devices." Abdul compared the results of his experimentally built prototypes using these materials, and showed the potential benefits of single crystal materials over traditional PZT for power transducers, as well as the manufacturing challenges that is limiting their wide-spread acceptance besides cost.

After the lunch break, the next talk was "Ultrasound Therapy" by Roel Deckers and Chrit Moonen from UMC Utrecht as a Medical Keynote talk, which was a follow-up to their lab tour on Monday morning at the UMC hospital that showed their technology in action.

Chrit Moonen **Roel Deckers**

Their work utilizes high intensity focused ultrasound (HIFU) in novel ways via phased-array type beam steering to simultaneously detect and destroy cancer in real-time without the need for invasive surgery, as well as treat brain diseases such as Parkinson's; they claim their ultrasound technology has the potential to revolutionize medical treatment for breast, brain and bone cancers, and their diseases.

The next talk was by **Dan Richards** from the LettUs Grow company on "Ultrasonic Applications in Aeroponics." Dan described how they are using ultrasonics for growing plants hydroponically indoors without soil by using the ultrasound waves to irrigate plant roots with a nutrient dense mist. Their "Drop & Grow" product is a self-contained "mini-farm" configured for recycled shipping containers, which is targeted for restaurants and institutional food commissaries to provide fresh vegetables on a daily basis.

The next presentation was by Leo Klinstein from Dukane Corporation on "Latest Developments in Power Ultrasonic Technology." Leo gave the attendees an update on all the new technology being developed at Dukane, such as overcoming the challenges of plastic welding disposable diapers that contain multi-layered materials including elastic, and also welding pouch spouts in food containers .

Amin Moghaddas from EWI Corporation discussed his research "On the Effect of Laser Surface Preparation on the Quality of Ultrasonic Wire Bonding Process in Battery Pack Assembly." Amin showed how laser surface treatments can improve the quality of semiconductor wire bonding (i.e., welded metal bonds) used for the battery connections in an electrical vehicle battery pack.

UIA51 Program Overview - Wednesday, continued

David Grewell from North Dakota State University discussed his research on "Ultrasonic Enhancement of Bio-Fuels," that provided an update on his developments for scaling the processing technology to industrial capacities by converting the starches in the plant more efficiently to alcohol for use in bio-fuels.

This part of the UIA 5ymposium Review is by Dominick DeAngelis

University of Glasgow participants alum at UIA51 (left to right): Abdul Chibli, Hilde Metzger, Jack Stevenson, Andrew Feeney, Margaret Lucas, Dan Richards (LettUs Grow), Mahshid Hafezi, Sandy Cochran, Andrea Cardoni (consultant in power ultrasound), and Dong Wang (University of Exeter).

Margaret Lucas Selected for UIA Fellowship

Dominick DeAngelis demonstrates the tuning fork for Margaret Lucas

Dominick DeAngelis, in one of his last duties as UIA President, had the honor of presenting the first UIA Fellow award to Professor Margaret Lucas FREng FRSE, Regius Chair of Civil Engineering and Mechanics, Professor of Ultrasonics, Dean of Research and Deputy Head, College of Science & Engineering, Director, Centre for Medical & Industrial Ultrasonics (C-MIU), James Watt School of Engineering, University of Glasgow.

The Fellow Award is accompanied by a personalized walnut box with a tuning fork, that can be displayed on the top of the box for display in Margaret's office.

Professor Lucas was the unanimous selection for the first UIA Fellow. Fellow Award Chair David Grewell noted, *This highly prestigious award is based on your many years of dedication and outstanding achievements in the field of ultrasonics. The letters of recommendation received on your behalf were extremely supportive and an amazing testament to your service to the ultrasonic industry.*

Nominations for the 2024 UIA Fellow Award are due by 1 Nov. 2023. For more information, contact Fran Rickenbach at fran@meinet.com

Ultrasound in the News

Researchers use ultrasound to control orientation of small particles

"By controlling the nozzle shape and the frequency and amplitude of the acoustic radiation, we can coerce particles of different shapes and material properties to behave differently. This, especially, applies to active particles such as nanorods: They can swim autonomously, and their control is especially challenging."

Acoustic waves may be able to control how particles sort themselves. While researchers have been able to separate particles based on their shape -- for example, bacteria from other cells -- for years, the ability to control their movement has remained a largely unsolved problem, until now. Using ultrasound technology and a nozzle, Penn State researchers have separated, controlled and ejected different particles based on their shape and various properties.

Acoustic waves may be able to control how particles sort themselves. While researchers have been able to separate particles based on their shape -- for example, bacteria from other cells -- for years, the ability to control their movement has remained a largely unsolved problem, until now. Using ultrasound technology and a nozzle, Penn State researchers have separated, controlled and ejected different particles based on their shape and various properties.

The researchers applied ultrasound to the nozzle, producing acoustic waves that, along with the flow of fluid, were able to separate the nanorod particles, aggregate them or extrude them from the nozzle.

"The separation concept relies on the fact that nanorods and spherical particles have different responses to acoustic radiation and generated fluid flow," Aronson said. "By controlling the nozzle shape and the frequency and amplitude of the acoustic radiation, we can coerce particles of different shapes and material properties to behave differently. This, especially, applies to active particles such as nanorods: They can swim autonomously, and their control is especially challenging."

This level of control in separating out particles had not been demonstrated previously, according to the researchers.

Aronson said this demonstration has implications for future technologies, including additive manufacturing, also known as 3D printing, and drug delivery.

"For 3D printing, the idea is you can add certain additives to the ink -- for example, nanorods," he said. "So now, we could separate nanorods from spherical particles to deposit only some in the printout, such as depositing polymers without nanorods and so on, all to change the property of the printout."

Aronson said this principle also applies to printing living cells, known as bioprinting.

"Potential bioprinting applications may include designing acoustic nozzles for bio-inkjet-like printers," he said. "By controlling the acoustic radiation in the nozzle, we can potentially? extrude certa in types of cells -- for example, stem cells -- and trap other types -- for example, bacteria. It's an additional control for bioprints."

This capability could also be useful for separating bacteria from cells in targeted drug delivery, Aronson said.

Ultrasound in the News, continued

The researchers next plan to mix live bacteria and cells in a lab setting and then separate and control them.

The paper's other authors are Leonardo Dominguez Rubio, a graduate student in the Penn State Department of Biomedical Engineering; Ayusman Sen, the Verne M. Willaman Professor of Chemistry at Penn State; and Matthew Collins, who was a Penn State chemistry graduate student at the time of this work.

The U.S. Department of Energy supported this work.

https://www.sciencedaily.com/releases/2023/06/230627123112.htm

New ultrasound method could lead to easier disease diagnosis

The breakthrough, made by Dr Artur Gower from the University's Department of Mechanical Engineering, together with researchers from Harvard, Tsinghua University, and the University of Galway, could be used to build new ultrasound machines that are able to better diagnose abnormal tissue, scarring, and cancer.

Ultrasounds use sound waves to create images of organs inside the human body. However, the images produced by the current techniques used in healthcare aren't usually enough to diagnose whether tissues are abnormal. To improve diagnosis, the researchers developed a way to measure forces such as tension by using an ultrasound machine. Tension is generated in all living tissue, so measuring it can indicate whether tissue is functioning properly or if it's affected by disease.

The researchers harnessed a technique from a rail project at the University of Sheffield, which uses sound waves to measure tension along railway lines. The technique, used both for rail and medical ultrasound, relies on a simple principle: the greater the tension, the faster sound waves propagate. Using this principle, the researchers developed a method that sends two sound waves in different directions. The tension is then related to the speed of the waves by using mathematical theories developed by the researchers.

Previous ultrasound methods have struggled to show the difference between stiff tissue or tissue under tension. The developed technique is the first capable of measuring tension for any type of soft tissue, and without knowing anything about it. In a new paper, published in the journal Science Advances, the researchers describe the new method and demonstrate how they used it to measure tension inside a muscle.

Dr Artur Gower, Lecturer in Dynamics at the University of Sheffield, said: "When you go to the hospital, a doctor might use an ultrasound device to create an image of an organ, such as your liver, or another part of your body, such as the gut, to help them explore what the cause of a problem might be. One of the limitations of ultrasounds used in healthcare now is that the image alone is not enough to diagnose whether any of your tissues are abnormal.

"What we've done in our research is develop a new way of using ultrasound to measure the level of tension in tissue. This level of detail can tell us whether tissues are abnormal or if they are affected by scarring or disease. This technique is the first time that ultrasound can be used to measure forces inside tissue, and it could now be used to build new ultrasound machines capable of diagnosing abnormal tissue and disease earlier."

https://www.sciencedaily.com/releases/2023/03/230310103414.htm

Ultrasound in the News, continued

Wearable ultrasound patch provide non-invasive deep tissue monitoring

A team of engineers at the University of California San Diego has developed a stretchable ultrasonic array capable of serial, non-invasive, three-dimensional imaging of tissues as deep as four centimeters below the surface of human skin, at a spatial resolution of 0.5 millimeters. This new method provides a non-invasive, longer-term alternative to current methods, with improved penetration depth.

The research emerges from the lab of Sheng Xu, a professor of nanoengineering at UC San Diego Jacobs School of Engineering and corresponding author of the study. The paper, "Stretchable ultrasonic arrays for the three-dimensional mapping of the modulus of deep tissue," is published in the May 1, 2023 issue of Nature Biomedical Engineering.

"We invented a wearable device that can frequently evaluate the stiffness of human tissue," said Hongjie Hu, a postdoctoral researcher in the Xu group and study co-author. "In particular, we integrated an array of ultrasound elements into a soft elastomer matrix and used wavy serpentine stretchable electrodes to connect these elements, enabling the device to conform to human skin for serial assessment of tissue stiffness."

The elastography monitoring system can provide serial, non-invasive and three-dimensional mapping of mechanical properties for deep tissues. This has several key applications:

In medical research, serial data on pathological tissues can provide crucial information on progression of diseases such as cancer, which normally causes cells to stiffen.

"We invented a wearable device that can frequently evaluate the stiffness of human tissue,"

Monitoring muscles, tendons and ligaments can help diagnose and treat sports injuries.

Current treatments for liver and cardiovascular illnesses, along with some chemotherapy agents, may affect tissue stiffness. Continuous elastography could help assess the efficacy and delivery of these medications. This might aid in creating novel treatments.

In addition to monitoring cancerous tissues, this technology can also be applied in other scenarios:

Monitoring of fibrosis and cirrhosis of the liver. By using this technology to evaluate the severity of liver fibrosis, medical professionals can accurately track the progression of the disease and determine the most appropriate course of treatment.

Assessing musculoskeletal disorders such as tendonitis, tennis elbow and carpal tunnel syndrome. By monitoring changes in tissue stiffness, this technology can provide valuable insight into the progression of these conditions, allowing doctors to develop individualized treatment plans for their patients.

Diagnosis and monitoring for myocardial ischemia. By monitoring arterial wall elasticity, doctors can identify early signs of the condition and make timely interventions to prevent further damage.

Wearable ultrasound patches accomplish the detection function of traditional ultrasound and also break through the limitations of traditional ultrasound technology, such as one-time testing, testing only within hospitals and the need for staff operation.

"This allows patients to continuously monitor their health status anytime, anywhere," said Hu.

https://www.sciencedaily.com/releases/2023/05/230502201346.htm

From the President

Margaret Lucas

UIA President

It was a great honour for me to be elected as President of UIA at our Annual Meeting this year, in the beautiful city of Utrecht in the Netherlands. I can't begin to imagine how I can fill the shoes of our outgoing president Dominick Deangelis, but I will do my best.

We were in Utrecht for another very successful Symposium, where we built on the joy we had in Warwick last year when we returned to having an in-person meeting, with Andrew Feeney providing the continuity of brilliant chairing again this year. We now have a hybrid format that is working really well – but nothing beats meeting new friends and reconnecting with old friends in person. There were so many great talks – for me the UIA Symposium blends industry and academic research applications perfectly. We learn so much from each other in a community of people passionate about the wide-ranging opportunities for ultrasonic technology.

The highlight for me was another huge honour – being awarded the inaugural award of UIA Fellow. I was given a beautiful, hand-crafted wooden box containing a tuning fork, which I have proudly exhibited on my office desk in Glasgow.

We are going to Ireland for our Symposium in 2024. A combination of great ultrasonics talks, the vibrant city of Dublin and springtime on the beautiful Emerald Isle – I can't wait. Hope to see you all there too.

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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.*

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

19 January, 2024: UIA51 Abstract Submission Deadline

September 2023: Virtual Collaborations Mini Symposium

November 2023: Virtual Collaborations

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