Volume 32 Issue 1: 2023 Winter 2023

ultrasonic industry association
UIA
powering sound ideas

Vibrations

Powering Sound Ideas

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

The UIA is looking forward to an engaging symposium chaired by Andrew Feeney, UIA51 Symposium Chair, has been hard at work to ensure that UIA51 will provide a balanced program of medical and industrial presentations from experts in ultrasound from throughout Europe, UK, and the US. In addition, post-doc ultrasonic research findings from universities will also be featured. UIA offers the crossroads of manufacturing, research and academia that provides for in-depth discussion about the current and future applications of ultrasound.

This year, our first day, Monday, 24 April, will feature medical presentations.

Our keynote speaker is Dr. Koen van Dongen, TU Delft on ***Imaging and inversion in medical ultrasound.***

Koen W.A. van Dongen received his M.Sc. degree in experimental physics from the Faculty of Physics and Astronomy at Utrecht University, The Netherlands, in 1997. His major research interest is in acoustics, and specifically in imaging, inversion, and modelling of nonlinear ultrasonic wave fields in inhomogeneous media for seismic applications.

On Wednesday, 26 April, the focus is on industrial applications and research results.

Chrit Moonen, Emeritus professor of Image Guided Molecular Interventions | Division of Imaging and Oncology| University Medical Center Utrecht will be our keynote speaker for this day.

Please see the presentations confirmed to date on page 4.
Go to www.ultrasonics.org for the session schedule day by day

Inside this issue:

UIA mourns the loss of Alan Broadwin, long time member and contributor to the ultrasonic industry. Please see his obituary on page 9.

UIA 51
powering sound ideas
24 - 26 April 2023
Karol V Hotel, Utrecht, The Netherlands

Everything you need to know to attend !

Traveling to Utrecht

Utrecht is a quick 30 minute train ride from Schiphol Airport in Amsterdam and then a 5 minute walk to Karel V Hotel

Utrecht is conveniently located with both train and air access from throughout Europe.

Delta, KLM, American, and United provide direct service from US gateway cities to Schipol Airport in Amsterdam.

Since all trains in The Netherlands stop in Utrecht, arriving from Schiphol airport is a quick 30 minute train ride.

The Karel V Hotel is a delightful 5 minute walk from the Central Station. The ease of access to major European cities provides great opportunities for pre and post Symposium travel.

Grand Karel V: UIA51 Headquarters Hotel

Make your hotel reservations

What was once a 14th-century monastery and served as accommodation for knights & priests is now a luxury five-star hotel in the centre of Utrecht.

Step inside a beautiful monumental building surrounded by several large gardens. You can relax in one of our spacious rooms overlooking the green surroundings.

If you wish to book either Saturday, 23 April or Thursday, 27 April, you must include the days of the Symposium. The default is for a sole occupant—you can adjust check-in if you have a traveling companion staying in your room.

Due to room renovations, a complimentary upgrade is offered to our main building to the Superior (Empire Rooms and Suites).

Tuesday Evening Event: Oudaen Brewery

Utrecht's canals offer a unique view of the city

Our evening begins with a tour of the Utrecht canals as we board our boat near our hotel. Oudaen brewery is right in the middle of Utrecht: around 75,000 litres of beer are brewed in the wharf cellar of Stadskasteel (City Castle) Oudaen every year, according to traditional methods. Each beer has its own distinct character. You can sample beers amid copper kettles, tap your own beer from the uKeg, enjoy a tour of this fully-renovated, modern brewery in the heart of Utrecht., followed by dinner.

This event is included in your Symposium registration;

extra tickets for guests are available.

UIA51 is Multi-Access

Based on the success with offering UIA50 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 Utrecht. However, all sessions will be available on Zoom and then for on-demand viewing for all UIA51 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.

UIA51 Registration is OPEN!

LIVE REGISTRATION FEES:

Members
From 1 February $899

Nonmembers
From 1 February $999

Students $495

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

Daily registration - Members
From 1 February $425

Daily registration - Non-members

From 1 February $599

VIRTUAL REGISTRATION FEES:

Members $650
Nonmembers $850
Daily - members $299
Daily - nonmembers $499
Students Full - $495
Students Daily - $199

Register NOW!

There is no substitute to being in-person, and for those of us that stayed all 3 days, you had the opportunity to talk and socialize with every attendee, which is unparalleled for any other technical conference!

UIA50 was a great conference, every year it brings industry closer to academia where the conversations and connections always aid understanding and collaboration.

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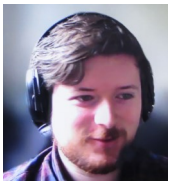
Utrecht is looking forward to hosting UIA51

UIA51 Program Overview

Dr. Hans-Jürgen Schreiner

Dr. Xuan Li



Jack Stevenson

Confirmed medical session speakers include:

Dr. Hans-Jürgen Schreiner, VP Innovation & Technology, CeramTec, GmbH, *Recent breakthroughs in sensor and transducer development*

Dr Heikke Niemenen, Aalto University, *How flexurally oscillating ultrasonic needles could improve healthcare?*

Martin Hofmann, University of Bern, *New approaches of planar piezoelectric ultrasonic transducers for effective periodontal scaling and care*

Dr Xuan Li, University of Glasgow, *A miniature ultrasonic surgical device based on a novel flextensional configuration*

Jack Stevenson, University of Glasgow, *A miniature ultrasonic surgical device based on a novel flextensional configuration*

Olga Yevlashevskaya, University of Birmingham, *Novel ultrasonic device for studying cells on titanium surfaces in vitro*

Our session will conclude with a wine and cheese reception before people explore one or more of the many restaurants in Utrecht just steps away from our hotel, Grand Karol V.

Tuesday, 25 April, will begin with a lab tour to UMC Utrecht. After lunch in Utrecht (starting at 8:35 am EDT) there will be three Insight sessions, aimed at discussions on the latest challenges facing scientists and engineers in ultrasonics:

Manufacturing Challenges - Leo Klinstein, Dukane
Translational Applications - Charlie Dowling, CeramTec, GmbH
Looking to the future - Dr. Hans-Jürgen Schreiner

There will also be a poster session with opportunity to talk with the authors about their research and outcomes to date.

Tuesday evening features our special event. We will take a canal boat from the dock in front of the Grand Hotel Karol V and explore Utrecht by the canals before docking at Oudaen brewery; around 75,000 litres of beer are brewed in the wharf cellar of Stadskasteel (City Castle) Oudaen every year, according to traditional methods. Each beer has its own distinct character. You can sample beers amid copper kettles, tap your own beer from the Keg, and enjoy a tour of this fully-renovated, modern brewery in the heart of Utrecht, followed by dinner.

Utrecht's canals offer a unique view of the city

UIA51 Program Overview, continued

On **Wednesday, 26 April**, the focus is on industrial applications and research results.

Chrit Moonen, Emeritus professor of Image Guided Molecular Interventions | Division of Imaging and Oncology| University Medical Center Utrecht will be our keynote speaker for this day.

Other industrial oral and poster presentations include:

Karl Graff, UIA Honorary member, *Power Ultrasonic Manufacturing Processes - Status of the Technology and Its Applications*

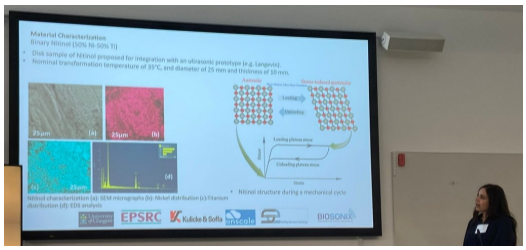
Hilde Metzger, University of Glasgow, *A tube transducer for flow-based ultrasonically enhanced technology critical metal recovery*

Dr. David Grewell, North Dakota State University, *Biofuels*

Dr Dominick DeAngelis, Kulicke & Soffa Industries, *Quantifying Power of Ultrasonic Transducers*

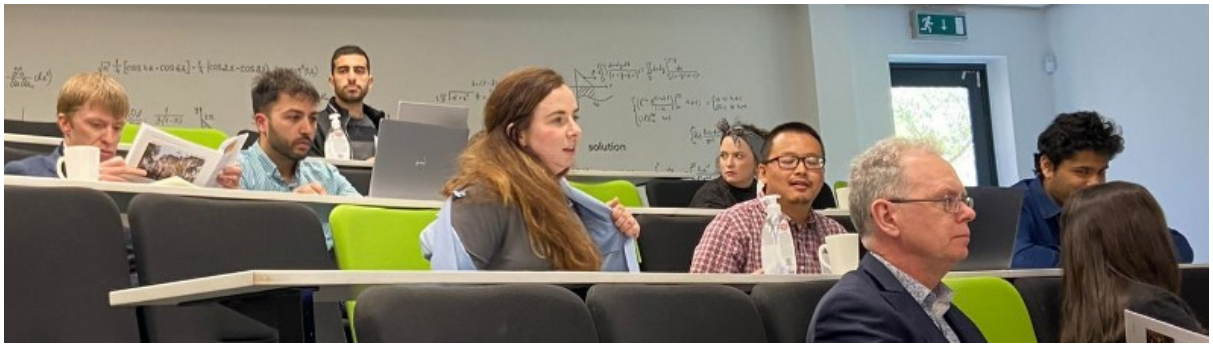
Leo Klinstein, Dukane, *Update on plastic ultrasonic bonding and more*

Dr Amin Moghaddas, EWI, *On the effect of laser surface preparation on the quality of ultrasonic wire bonding process in battery pack assembly*



Dr Mahshid Hafezi, University of Glasgow, *Nitinol's tribological characteristics for adaptive ultrasonic devices*

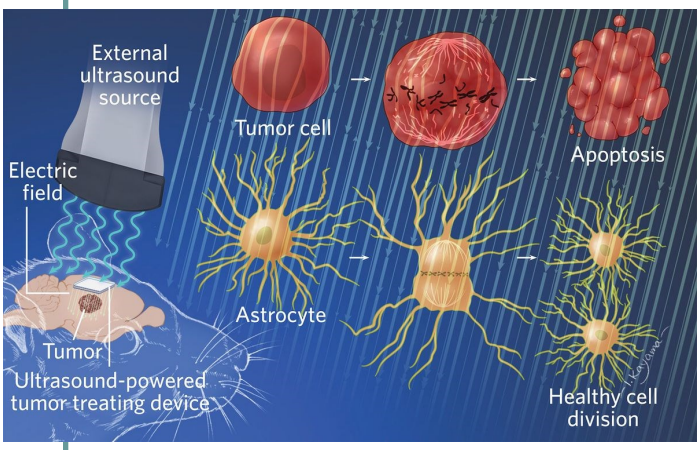
Dr Sakineh Fotouhi, University of Glasgow, *Full-property measurement for piezoelectric devices through applied artificial intelligence*



UIA50 Workshop session observers

Ultrasound in the News

Implantable Device Zaps Cancer Cells Using Electric Fields



A wireless device implanted inside a rat brain shrinks cancer cells remaining after surgery. When triggered by ultrasound, the implant produces an electrical tumor-treating field (TTF) that interferes with proteins involved in cell division and triggers apoptosis in tumor cells. Healthy cells such as astrocytes, meanwhile, aren't disrupted by the electrical frequency emitted by the device, while neurons are unaffected because they don't divide. The researchers say that two implants would be used in humans, sandwiching the tumor.

Glioblastoma, an aggressive brain cancer diagnosed in approximately 12,000 people in the US each year, is difficult to treat. The tumor invades brain tissue, making complete removal impossible. Recently, electrical fields known as tumor-treating fields (TTFs) have shown promise in destroying tumor cells, but traditional TTF devices are unwieldy: they require electrodes to be bandaged to the patient's shaved scalp and are powered by a book-size battery that patients must carry while wearing the device for at least 18 hours per day for months or even years after tumor-removal surgery, says Ohio State University radiation oncologist Joshua Palmer. Now, researchers in China have developed a more user-friendly implant that inhibits tumor growth in cultured cells and in rats (Sci Adv, 8:eabm5023, 2022).

TTFs interfere with charged molecules involved in cell division. During mitosis, tubulin proteins assemble into spindle fibers that pull chromosomes into two separate cells. Alternating electrical fields prevent tubulin polymerization, stalling mitosis and triggering cell death. Cancer cells, due to differences in morphology and growth rate, are more vulnerable to mitotic disruption than healthy cells, especially given that mature neurons don't divide.

Bingzhe Xu, a biomedical engineer at Sun Yat-sen University in Guangdong, China, and colleagues have built a chip-sized, wireless device they call an ultrasound-powered tumor treating device (UP-TTD), which can be implanted into the tumor site during surgery. It converts ultrasound radiation into electrical energy using a tiny generator consisting of a polymer membrane, a thin piece of copper, and a hollow center wrapped in biocompatible material.

When ultrasound radiation is externally applied to the UP-TTD, the polymer membrane vibrates against the metal layer, generating an electric charge. The whole device is less than 500 micrometers thick yet remains intact after hundreds of bending tests.

The device could address the several design problems of current TTF devices, says Palmer, who

Ultrasound in the News, continued

wasn't involved with the new study. For starters, users no longer need to shave their heads for months on end or carry a large battery. By focusing the electrical field on the target area, rather than the whole head, the device offers "more than 1000 times improvement on spatial resolution" over existing TTF devices, Xu writes in an email to The Scientist. Since TTFs from the UP-TTD don't need to penetrate the skull, they stay concentrated around the tumor site and require less energy, adds Xu.

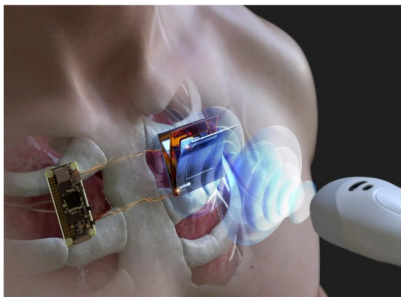
In tests, the team placed the UP-TTD on either side of cultured glioblastoma cells removed from patients and activated them with ultrasound. After 12 hours, the cells' growth rate decreased by as much as 58 percent compared with cells not exposed to TTFs. The researchers also implanted the device into rats with brain tumors; after six days of ultrasound treatments, the animals' tumors were about 73 percent smaller than those of their untreated littermates.

Palmer raises one caveat: the device's fine resolution could backfire for cancers that tend to migrate throughout the brain. "I could see a situation where you might want to use both [approaches]," he says, adding that he suspects the UP-TTD could work on other cancer types, especially more-localized tumors.

https://www.the-scientist.com/modus-operandi/implantable-device-zaps-cancer-cells-using-electric-fields-70786

Using Ultrasonic Waves To Charge Underwater and Body-Implanted Electronic Devices

New technology improves the efficiency of wireless energy transfer of ultrasonic waves by triboelectric power generation. Ultrasonic waves have applications in wireless charging of batteries underwater or in body-implanted electronic devices.

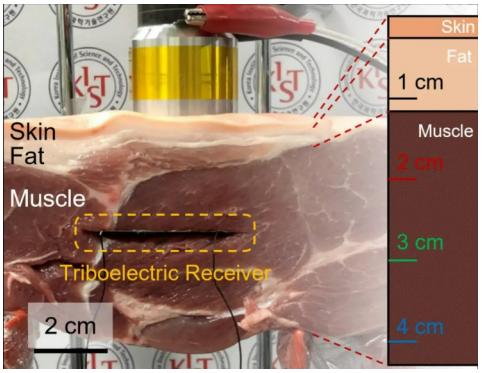


Schematic illustration of wirelessly charging a body-implanted electronic device using an ultrasonic probe. Credit: Korea Institute of Science and Technology (KIST)

The number of patients using implanted electronic devices, such as artificial pacemakers and defibrillators, is increasing worldwide as the population ages and medical technology advances. Currently, batteries for body-implanted devices are replaced through an incision operation, which can lead to health complications. As a result, a novel wireless energy transfer charging technique is being developed that can be used to charge body-implanted devices without surgery. This same technology can also be used to charge the batteries of underwater devices, such as sensors, that are used to monitor undersea cable conditions. Electromagnetic (EM) induction and magnetic resonance

Ultrasound in the News, continued

can be used in wireless energy transfer. EM induction is presently being used in smartphones and wireless earphones; however, its usage is limited because EM waves cannot pass through water or metal, resulting in short charging distance. In addition, this method cannot be easily used to recharge implanted medical devices as the heat generated during charging is harmful. The magnetic resonance method requires that the resonant frequencies of the magnetic field generator and transmitting device are exactly the same; moreover, a risk of interference with other wireless communication frequencies, such as Wi-Fi and Bluetooth, exists.



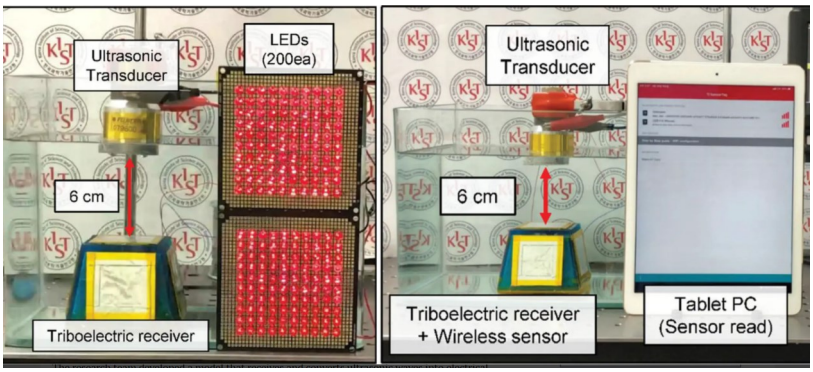
Wireless acoustic energy transfer into implantable devices within pork (skin and flesh) as a substitute for the human body.

The KIST team, therefore, adopted ultrasonic waves as an energy transmission medium, instead of EM waves or magnetic fields. Sonar, which uses ultrasound waves, is commonly used in underwater environments, and the safety of using ultrasonic waves in the human body has been guaranteed in various medical applications, such as organ or fetal condition diagnosis. However, the existing acoustic energy transfer methods are not commercialized easily due to the low transmission efficiency of acoustic energy.

The research team developed a model that receives and converts ultrasonic waves into electrical energy using the triboelectric principle that allows for the conversion of small mechanical vibrations into electrical energy effectively. By adding a ferroelectric material to the triboelectric generator, the ultrasonic energy transfer efficiency was significantly improved from less than 1% to more than 4%. Moreover, charging of more than 8 mW power at a distance of 6 cm was possible, which was sufficient to simultaneously operate 200 LEDs or to communicate Bluetooth sensor data underwater. In addition, the newly developed device had high energy conversion efficiency and generated marginal amounts of heat.

Dr. Song explained the significance of the results as follows: "This study demonstrated that electronic devices can be driven by wireless power charging via ultrasonic waves. If the stability and efficiency of the device are further improved in the future, this technology can be applied to supply power wirelessly to implantable sensors or deep-sea sensors, in which replacing batteries is cumbersome."

Reference: "Ferroelectrically augmented contact electrification enables efficient acoustic energy transfer through liquid and solid media" by Hyun Soo Kim, Sunghoon Hur, Dong-Gyu Lee, Joonchul Shin, Huimin Qiao, Seunguk Mun, Hoontaek Lee, Wonkyu Moon, Yunseok Kim, Jeong Min Baik, Chong-Yun Kang, Jong Hoon Jung and Hyun-Cheol Song, 22 Jan 2022, Energy & Environmental Science. DOI: 10.1039/D1EE02623B



UIA mourns the loss of Alan Broadwin

BROADWIN--Alan. Age 87, on December 17, 2022. Predeceased by his beloved wife Naomi of 57 years. Devoted father to Esther Fendrick and Lee Weiner, and Valerie and Jeffrey Mutterperl. Cherished grandfather to Joshua and Erica, Zachary, Gabriel and Alexander. Contributions in his memory can be made to Columbia University's College of Engineering or Westchester Reform Temple - Jewish Music and Spirituality Fund.

Published by New York Times on Dec. 20, 2022.

Alan's daughter, Valerie Mutterprel, would be delighted to receive other memories of how her father impacted people's work in ultrasonics. Her email is: valeriemutterperl@gmail.com

Alan was a valued member of the Ultrasonic Industry Association. He would take the time each year when renewing his membership, catching up on what was happening in the industry.

Here are comments from UIA board members about Alan's impact on UIA and their memories of Alan.

This is sad news. I worked with Alan on a numerous projects, a lot with the UIA and some in business as well. Always enjoyed his stories of the early days of the UIA and the ultrasound field in general. My condolences to his family. It is difficult to lose a loved one at any time, but it is especially hard at this time of year.

Ron Manna

I only had the opportunity to discuss ultrasonics with Alan Broadwin once at a UIA lunch, but I see his influence on the technology in CUSA (Cavitron Ultrasonic Surgical Aspirator) all the time.

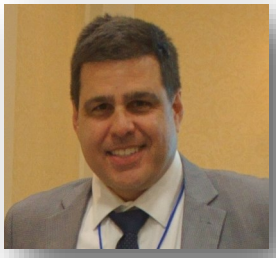
Daniel J. Cotter
Director Advanced Product Development, Codman

This is very sad news indeed. I would not be a part of the UIA if not for Alan. Indeed, a large part of my career is based on testing ultrasonic surgical instruments, and it started in the '90s when Alan asked me to work with him on measuring a CUSA with a different frequency and tip design. He also pushed that the work become part of IEC standards. He was very focused on spreading information for the greater benefit, and I recall his time as UIA president and conference leader. I was privileged to present the laudation when UIA honored him a few years back. He was always cheerful, positive, patient, and encouraging, as well as wickedly smart and insightful. A true pioneer and a leader in so many ways.

Mark E. Schafer, Ph.D.
FASA FAIUM FAIMBE

Sonic Tech, Inc.

From the President



Dominick DeAngelis

UIA President

Planning for the UIA 51 Symposium in Utrecht is now in the final stages, and the program has really filled-out quite nicely in no small part due symposium chair Andrew Feeney's noble efforts! For those attendees still contemplating a presentation, there is still time to "squeeze" you in, so submit your abstract ASAP. The "Hybrid" details are now finalized with professional videographers to provide multi-access options again this year via Zoom, as well as archiving all recorded presentations for on-demand viewing, and we even have some virtual attendees that will be presenters too. At the risk of sounding like a broken record, I hope that everyone who has the means and opportunity to attend in-person does so, since the "real" magic of our conference happens in-between sessions, in the hallways, and especially at the events when plied with refreshing beverages and tasty food

Broken record be dammed, our in-person attendees in Utrecht will be treated with a canal boat ride to the historic Oudaen Brewery that has been operating since the Middle Ages, followed by a hands-on tour with beer samplings from copper kettles, and concluding with dinner in a stunning 13th century property. Hope to see you soon in Utrecht!

UIA Board

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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 51
powering sound ideas
24 - 26 April 2023
Karol V Hotel, Utrecht, The Netherlands

24 - 26 April 2023: UIA51, Karel V Hotel, Utrecht, The Netherlands

June 2023: Virtual Collaborations

September 2023: Virtual Collaborations Mini Symposium

November 2023: Virtual Collaborations