

New Royal Academy of Engineering Fellows announced in the field of Ultrasonics

The Royal Academy of Engineering (RAEng) is a learned institution and charity whose stated aim is to harness the power of engineering within the United Kingdom in order to build a sustainable society and an inclusive economy that works for everyone. They work to grow talent and develop future skills, driving innovation, building global partnerships, influencing policy, and engaging with the public. The Royal Academy's Fellowship represents the nation's best engineering researchers, innovators, entrepreneurs, and business and industry leaders. Election to the Academy is by invitation only; about 50 Fellows are elected each year through peer review and nominations made by existing Fellows. They are distinguished by the title Fellow of the Royal Academy of Engineering and the post-nominal FEng. This year, two of the Fellows elected were recognized for their contributions to the field of Ultrasonics. We took the opportunity to meet each of them to discuss their career and what the award means to them and their field. Meet Professor Lucas FEng, FRSE.

Professor Margaret Lucas FEng, FRSE

Professor Margaret Lucas FEng, FRSE, is a Scottish mechanical engineer specializing in high-power ultrasonics, across applications including planetary drilling, oil and gas exploration, food processing and ultrasonic surgical devices. She is the Regius Chair of Civil Engineering and Mechanics and Professor of Ultrasonics in the James Watt School of Engineering and Dean of Research in the College of Science and Engineering at the University of Glasgow. She is also Director of the Centre for Medical and Industrial Ultrasonics.

Margaret gained her mechanical engineering degree from the University of Aberdeen, and earned a PhD in high-power ultrasonics at Loughborough University. She remained at Loughborough as a lecturer, then moved to the University of Glasgow in 1996 where she became a professor in 2006. She was elected as a Fellow of the Royal Society of Edinburgh in 2020 and also in 2020, the Institution of Engineering and Technology awarded her the IET Achievement Medal for Ultrasonic Technology. Earlier this year Margaret was elected a Fellow of the Royal Academy of Engineering.



1. Congratulations on becoming a Fellow of the Royal Academy of Engineers, can you explain what this means for you and your career?

First, I would say that I feel very humbled and hugely grateful to the Royal Academy of Engineering for recognising the work. I am really grateful to those that nominated me and those that supported that nomination, because what other people have to say about you is a key element of becoming a fellow. It is great to see the recognition of ultrasonics and this has made me hugely proud. Also, the fact that becoming a Fellow is a reflection of the great work done by a team of researchers that I have led over a long period. I am very driven by my research but I am also driven by academic life as a whole. I have always really enjoyed the management side of my career, developing people and being influential in my institution, trying to create an environment that is fantastic to work in, as well as having fantastic activity happening in it, is something I think has been rewarded.

2. Can you tell us a little about your career path, what it has involved, what have you most enjoyed and what you have been most proud of in your achievements?

I studied for a degree in mechanical engineering and came into ultrasonics from a vibrations engineering perspective, which at the time was possibly quite unusual. To me, vibrational behaviour and performance of ultrasonic devices and their control, understanding and enhancement, their characterisation has been hugely important and an area I have been able to lead in, which is something I'm particularly pleased about and proud of. There have been many aspects to my research in ultrasonics, but they have all come from a vibrational engineering perspective. That body of work, pushing vibrational device enhancement into ultrasonics engineering is probably amongst the achievements I'm most proud of, that and the researchers that have come out of my group and what they've gone on to achieve.

If I had to pick two aspects of my career that I've most enjoyed, firstly it would have to be those meetings you have with researchers where something really interesting comes out; either it is because you're jumping up and down with joy, or you're scratching your head and trying to figure out what's going on. I suppose that is what academic life is about. The second aspect is to do with the huge enjoyment I get from devising initiatives that can enhance the academic environment, and by driving them through can make a difference. That can be across quite diverse aspects of academia and this is probably why I have ended up where I have as Dean of Research at the University of Glasgow, having spent 9 years as a head of division prior to that.

3. Fellowship of the Royal Academy of Engineers recognising the contributions engineers have made to society - what do you think has been the key to your success?

I think a major factor has been that my research has impacted quite a large number of application areas and fields. I have worked with multiple industries and partners from day one as an academic and some of that research has seeped into what they do on a day-to-day basis. That is where I've been able to make a significant impact.

4. Your career has included an impressive set of gender firsts - first woman Professor in the school of Engineering at the University of Glasgow in 2010, becoming one of the very few women PIs to hold an EPSRC Programme Grant in 2018, the first woman Regus Chair of Mechanics and Civil Engineering. How do you feel about this and being seen as a role model for earlier career women in ultrasound engineering? What advice would you offer earlier career researchers or engineers?

The honest truth is that I'm not sure I really know the answer to this, all I can say is that for myself I have a fundamental love of the job. I've been well supported by a few key people. I don't think that throughout my whole academic career there has always been the right support, but there have always been some key people that have been very supportive.

In some ways when you are in a small minority, you do not have anything to compare yourself with apart from other colleagues. I mostly haven't thought of myself as the only woman. I was the first female mechanical engineering lecturer at Loughborough University so I could not compare myself to other women colleagues. All you can do is work out how to do things in collaboration with your colleagues, and when you're in an environment where people are happy to be supportive and work together on things, and they treat you well and are considerate, then you can thrive.

In terms of being a role model, I do think it is very important to have role models, but I also think it is incredibly important for role models to be honest. At several points in my career, I came really close

to giving up, and the danger with role models is that the focus is on what they have achieved and not on the difficulties they may have faced. Role models are great, but what you really need is a passion to thrive and if you do not have that you will struggle. I would also say that you need a lot of resilience, and there have been times in my career where I have felt very resilient and other times when I have not. I suppose what good support does, and good training, is that it helps you to build that resilience but a passion for what you do has to be part of it too.

5. What challenges have you had to deal with in your career? Or what has been the most challenging problem you've faced in your career?

There have been many technical challenges but that is the joy of research, some of them you never really solve, and hopefully some you make progress in. Nearer the start and middle of my career, I think I would have said other people – working with other people is the most rewarding and the most challenging aspect of any career. But, I do think that academia as a whole has got a lot better in this regard. We are much more able to welcome differences, different points of view, but also different styles of working. We are much more willing to embrace those differences than may have been the case in the past. I think we have moved on a lot and it is better now.

Aside from this, another area I have learnt a lot about is talking about research to industry. I've got a lot better at that during my career, but in the earlier days, that was very challenging.

I have to say though that the biggest challenge of my whole career has been managing childcare, that period of childcare management was just really difficult.

6. How has IEEE UFFC membership contributed to your career development or what career support would you have liked to have been available that perhaps wasn't in the past?

The UFFC, and other technical societies in ultrasonics or beyond, are absolutely essential to academic careers. Whether it is the conferences, or the events, or belonging to a group, they are the main source of networking and collaboration, of hearing about other people's work, and routes to generating new ideas. Somehow, when we have our own ideas, they have grown out of other things we have seen, conversations we have had. These societies underpin such a lot of our research.

In terms of what they offer in the future, I see these societies developing beyond just technical societies. It is much easier now to be involved in a society and take on leadership roles at a much earlier career stage. In the earlier part of my career, you were expected to be a professor before you would be invited to be on certain committees and I don't think that's the case anymore. There's a much broader range of experience and that's been really positive.

7. Finally, what inspires you about the future of ultrasound, and what do you predict will be the next big innovation in ultrasound science?

The whole area of ultrasonics is growing at a huge pace. There has been an explosion of innovation in medical applications across diagnostics, therapy and surgery, and I think that is going to continue. Academics are often driven by the combination of economic and societal impact and that has made the medical field more attractive. Personally, I think industrial applications, particularly in manufacturing, are still very under exploited and I would like to see more push in that direction. There are many niche areas where ultrasound technologies are very strong in manufacturing but there is just so much more opportunity for innovation. There is maybe not enough funding going into it and maybe its slower to progress but I hope there is going to be an explosion there just as there has been in medical ultrasound.

Overall, my main sentiment is what a fantastic field ultrasonics is to work in. I am so glad that I stumbled into ultrasonics, so glad because it has been the basis of my whole career.