

Ask an Acoustician: Efren Fernandez-Grande

*Efren Fernandez-Grande and
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Meet Efren Fernandez-Grande

In this “Ask an Acoustician” essay, we feature Efren Fernandez-Grande, a Spaniard who finds himself in Denmark. Efren is an associate professor in the Acoustic Technology Group in the Department of Electrical Engineering of the Technical University of Denmark (Kongens Lyngby; DTU, from the Danish acronym). Efren is a member of the Signal Processing Technical Committee of the Acoustical Society of America (ASA), regularly organizing sessions and serving as the technical program coordinator. He is also a Fellow of the ASA and serves as an associate editor for *The Journal of the Acoustical Society of America*. I will let Efren tell you the rest.

A Conversation with Efren Fernandez-Grande, in His Own Words

Tell us about your work.

My work mostly consists of doing research and teaching, but I also hold some institutional responsibilities. My research lies in the areas of sound field analysis, acoustic holography, signal processing, and sound radiation. Much of the research I do is concerned with analyzing the spatial properties of sound fields and developing methods for reconstructing sound fields in cases where only a limited number of observations are available. Other aspects of my work involve methods for sound localization, typically using microphone arrays as well as sound field reproduction, inverse problems, and acoustic measurement techniques. I teach a couple of graduate-level courses that are closely related to my areas of research. Besides research and teaching, I am head of studies of our international MSc in engineering acoustics, and I am involved in several organizations in acoustics, including the ASA, the European Acoustics Association, and the

Danish Acoustical Society. I also enjoy engaging in outreach activities (e.g., open houses, laboratory tours and demonstrations, or school visits) as a way to demonstrate and share our work with the general public.

Describe your career path.

I am originally from Spain where I studied electrical/telecommunications engineering with a major in acoustics and later moved to Denmark, which is one of the leading countries in the field of acoustics, to pursue my graduate studies at the DTU. I had the good fortune to obtain a PhD scholarship under the supervision of Finn Jacobsen, who was a great mentor and a very inspiring person to work with. After receiving my PhD, I was fortunate to obtain a fellowship from the Danish Council for Independent Research, which allowed me to continue my work as a postdoc. Along the way, I obtained a tenured faculty position at the DTU where I continue to work now as an associate professor in the Acoustic Technology Group.

What is a typical day for you?

Days can be very different from each other, of course, but I would say that a “very good day” is one where I cycle to work early and use the first few hours to do some writing or key research work (e.g., a new idea, plan a key experiment, theoretical work). Later, I might have a meeting with one of my PhD students to discuss their progress and provide insight. I would have lunch at noon, typically with my colleagues in our shared kitchen/lunchroom or outdoors in the gardens by the laboratory when

the weather is good. Then, with a fresh cup of coffee, I attend to pending e-mails and do some work as associate editor or reviewer or might have a meeting with collaborators, or attend to my duties for the MSc in engineering acoustics at the DTU. By around 2 or 3 pm, as meetings recede and the inbox starts to slow down, I try and use some uninterrupted time for my research and experiments before going home and enjoying some family time. Teaching days are quite different because many hours go into the classroom, which is also nice. In 2021, a “new-normal” typical day would involve many Zoom online meetings and a lot of working from home as well as more simulations than experiments, but still the essence is similar, although I miss in-person interactions and cycling to work!

How do you feel when experiments/projects do not work out the way you expected them to?

That’s a good one. Well, they often turn out different than planned, so I keep a moderate expectation. It might sound cliché, but I set myself to expect the unexpected and it works just fine. Often the data seem not to make any sense at first, especially in challenging experiments, but I remind myself that an experiment rarely fails completely (a seemingly failed one could hide new knowledge or point to a methodological refinement). So I try to work my way through the data, observing patiently and with caution...as they say, *everyone trusts an (experimental) observation, except the person who made it.*

Do you feel like you have solved the work-life balance problem? Was it always this way?

Yes, I think I have found an enjoyable and healthy balance. I love the work that I do, and I am easily drawn to it. At the same time, I enjoy so many great things outside work that it is simply very difficult to neglect them. Sometimes one might encounter a “freak wave” of tasks related to research, teaching, proposals, departmental duties, and other items, which can be challenging. When a wave of work lasts for too long, I try to press the reset button, prioritize things, and get back to finding my balance or else the intrinsic motivation suffers. I became a father some months ago (such a wonderful experience), and this has made me live and enjoy the moment very much, being more focused at work and spending great quality time at home.

What makes you a good acoustician?

I am not sure if there are bad acousticians out there. Attributes that help me in my work are that I am inherently curious, I enjoy the process of discovery, and this drives my intrinsic motivation to work. Also, I am lucky to work in an area where you can start working on an idea on a blackboard or piece of paper, you can test it numerically, later go down to the laboratory to validate it experimentally, and listen to your experiment while walking around refining the setup. The process is extremely valuable because it allows time for reflection and for developing a good understanding of the relevant phenomena. Sometimes people are surprised to find me performing my own experiments instead of asking a student to do it, but I like it. This is something I learned from my PhD advisor Finn Jacobsen, no matter how busy he was, he would always have time to jot down some equations on a piece of paper and go to the laboratory to test his ideas firsthand. I always admired this. I remember that about 10 years ago, we had a meeting one evening with a close collaborator and they would not fully agree on some properties of the experiment we were planning. It was about which reference transducer should be used, and the properties of the resulting cross-spectral matrices. The meeting finished, we left, and the matter was left unresolved or so it appeared (eventually Finn was right, but that’s not the point). The next morning, I met Finn entering work and the first thing he told me, with a smile on his face, was, “Efren, yesterday before going home, I went to the lab and tried out some measurements. As far as I can see, if you use this sensor as a reference... etc.” As the years go by, I understand more and more the long-term value of going through the whole process from blackboard to laboratory experiments firsthand.

How do you handle rejection?

I do not take it personally, or that’s what I like to think. If it is justified and constructive, I handle it well because it contributes to a better outcome. If the rejection is poorly substantiated, it is upsetting, but this is rare. Most rejections happen after careful consideration.

What are you proudest of in your career?

I would say mentoring. It is one of the outcomes of my work that I enjoy and value the most. There are other aspects of my research that I find gratifying, although

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the feeling is closer to intellectual satisfaction than pride. My own experience as a PhD student was invaluable, and now in my work as advisor, I strive to pass on that experience, support my students, and help them become the best scientists that they can be. I am constantly amazed by the capacity of my PhD students to learn and to improve over time. Honestly, I am so proud of every one of them.

What is the biggest mistake you've ever made?

This is a tricky one. As I look back, I cannot spot a big mistake that I wish would not have happened. I can count small mistakes, which probably amount to more than a large one, but it is hard picking out a specific one.

What advice do you have for budding acousticians?

Make sure to cherish the things that drive your intrinsic motivation and do not compromise that.

Have you ever experienced imposter syndrome? How did you deal with that if so?

Yes, in a mild form I guess. I have experienced it at times where I felt I did not know enough about a certain topic. It is a strange feeling. The way I have dealt with it is to think of a few years back and reflect on how much I have learned since then. This helps me realize that the question is not only how much you know but also how much you learn. This is great motivation to continue working and enjoy the process.

What do you want to accomplish within the next 10 years or before retirement?

I would like to advance the way in which we sense sound fields, how we process the acquired acoustic information, and how we interact with sound and the acoustic medium. I look forward to finding ways to measure sound remotely and with precision, either by means of remote sensing principles or via sound field reconstruction methods. We are witnessing great advances in how we acquire data, via new sensing approaches, sensor networks, and sensate media as well as developing more refined methods to process those data while simultaneously our computational capacity continues to grow exponentially. I find that the area where my work lies, somewhere in between sound field analysis, sensing methods, and signal processing, is at a very exciting point in time, where the confluence of

advances in these respective domains can open significant paths of exploration. Besides this, I want to contribute to creating more diverse and inclusive academic environments, mentor great researchers, and, as far as I can, have a positive influence on society.

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