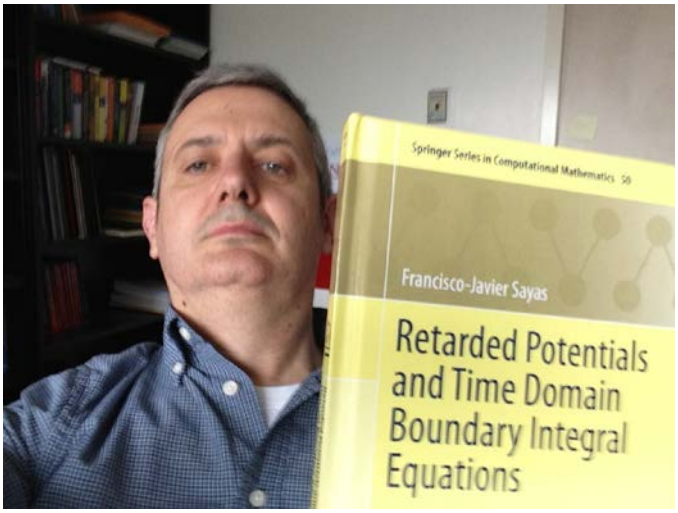
MAPPING THE ROAD

Francisco-Javier Sayas, May 2016

(This is an article I wrote for the departmental newsletter. For one reason or another it was never published.)



This past month of April, my monograph *Retarded potentials and time domain boundary integral operators - a road map* hit the shelves in a beautiful edition in the Computational Mathematics Series by Springer Verlag. The editors of *Reckonings* asked me to write or be interviewed about the book. Instead I thought of sharing my experiences around the writing of this piece of work. I hope I can retain your attention until the end of this little piece of cheap philosophy and personal exhibitionism.

How did this all start? Around 2005, I got into the topic of boundary integral equations for transient acoustics with my then PhD student Antonio Laliena. Antonio is a massively detail oriented person, who led me to realize that we didn't really understand most of the literature on the topic. So we set to breaking the existing papers into small pieces, trying to reconstruct the theory at a level of thoroughness that would satisfy us both. I was lucky at the time to have recently met some of the key names in the area, especially Lehel Banjai and Christian Lubich, who have become my collaborators since. They gave me direct access to basic ideas and pointed me to the "right" references.

Back to the book. My way of studying a new topic is always to write classnotes, giving all details and looking for patterns in the analysis. (In short, my goal is that once I've gone through the pains of understanding something difficult, I don't want to ever think about it again.) I was invited to deliver a lecture series in a summer school in Spain in 2011 and I set to type what I had understood at the time, so that the attendees could have the notes and I could just go ahead and teach the course in my often self-praised blackboard style. These notes are now the first four chapters of my road-map (this is how my students call the book). As I learned more about the topic and started getting my own take and my new results in the area, the notes grew to about two hundred pages of material, including a gallery of exercises. Some of the new ideas came quite fast, while trying to explain my research to colleagues in blackboard seminars in the Oberwolfach Institute of Mathematical Research. My graduate students were the first

serious users of these notes that I considered almost finished in 2014. I was going to do nothing with them until my colleague and friend Gabriel Gatica (a UD alumnus) put me in contact with his Springer publisher, Donna Chernov. All of a sudden the notes were a book proposal and shortly thereafter, a reality in the Springer catalog.

We just went, in two paragraphs, from starting the book to having it published. Finishing the book was, however, a difficult task. As you write and write, you get ambitious and want to keep on adding chapter after chapter (my collaborator Bernardo Cockburn from Minnesota calls this "maximalism"). Where do you stop? Even after the book was finished and submitted, referees suggested adding more material. That was, for instance, the origin of an appendix on the integral equations for electromagnetics, an area I wouldn't have touched before with a ten foot pole. In any case, I got to a point where I decided to call it a book and eventually the manuscript entered production in the fall 2015. At the time I realized I had never thanked my parents openly for being so extremely supportive when this crazy idea of crossing the herring pond and moving to the States got hold of me as I approached my forties. The book is now dedicated to them. (Unfortunately, my mum passed before she got to know about it, but that's a sad story for another day.)

One of my surprises when publishing the book was how smooth the entire process is. Writing seems to be much more difficult than publishing. Mathematical books come in all flavors and getting your own (and deciding on the scope of the text) is an important step. My buddy Michael Neilan from U Pitt once told me that I can be recognized in my papers, which is a rarity given the traditional severe style of the scientific literature. I have to confess that the relaxed informal tone of my writing (which is widely used in the book, even if part of it is a sequence of theorems and proofs!) is a studied pose. I learned a lot about writing by regularly collaborating in a newspaper for over fifteen years. However, getting the correct tone in a foreign language is quite the challenge. In any case, the goal of my monograph was self-study: I wanted something that mathematical grown-ups (say a graduate student with some analytical background and the ability to read texts written for the mathematically literate) could read by themselves. It's been a long process, but I'm mighty proud of the result, even if I found a couple of typos even before I got my first copy.

It would be unfair of me not to acknowledge the help I got (reading, proofreading, learning, drawing figures) from my students Tianyu, Tonaiuh, Matt, and Allan. They were my first audience. I do also have to mention the inspiration that comes from feeling part of the Delaware scattering group: back in the old continent, my only knowledge of the existence of Delaware was from a list of fiscal paradises and from the affiliations of several top-notch researchers in integral equations and inverse problems that I can call now my colleagues.

Putting your time and heart into a text that expands and/or clarifies the mathematical knowledge is an effort I decidedly recommend. And I'm planning to repeat the experience.