



ANTONI ZYGMUND  
1900–1992

## In Memoriam

Antoni Zygmund

(December 26, 1900–May 30, 1992)

Antoni Zygmund died on May 30, 1992, at the age of 91. His mathematical legacy lives on, in his papers, his books, and his students and their students.

His research includes such major work as the theory of singular integrals in  $n$ -dimensions which goes under the name of *Calderon and Zygmund singular integrals*. He was one of the first to realize the importance of complex methods in harmonic analysis and, independently of Thorin, discovered a complex variable proof of the M. Riesz interpolation theorem. He also wrote the first detailed treatment of Marcinkiewicz's interpolation theorem. These are the two main tools which lead to the theory of interpolation spaces, both the complex theory and the real theory. In approximation theory, he showed that  $L \log L$  is the right substitute for  $L$  in many questions, and he introduced the space which he called  $A$  as the right space to substitute for  $Lip\ 1$ , and then proved one of the early saturation theorems. Many of his other contributions have been used by others in approximation theory.

It is difficult for younger mathematicians to realize the importance of the first edition of Zygmund's *Trigonometric Series*. It was thought at the time when he wrote this book that it would be impossible to bring order into the complicated results which seemed not to have an overriding structure. I heard this from more than one person when I started to read this book, twenty years after it was first published. After the second edition was published, I never heard *Fourier Analysis* described as a subject without structure, since *it was there* in these two marvelous volumes.

As important as Zygmund's research, his books, and his two joint texts on complex and real analysis were, his work with students is probably his most important legacy. The Calderon–Zygmund seminar, as it was known when I went to it for two years, was an exciting place to learn how mathematics was done, how problems are uncovered and developed, and what mathematical taste is. There was a one hour lecture, with Zygmund often making very perceptive comments, and then an informal second hour which was full of open questions, some of which would be solved on the spot by others in the room. It played a central role in my development as

a mathematician, and for many others as well. A list of Zygmund's students in the United States and their students is given in Part III of *A Century of Mathematics in America*.<sup>1</sup> Zygmund also had Ph.D. students in Poland, including J. Marcinkiewicz. Zygmund's account of how Marcinkiewicz developed appears in the *Collected Papers* of Marcinkiewicz which Zygmund edited. The *Selected Papers of Antoni Zygmund*<sup>2</sup> should be in every major library, and the account of Zygmund's work contained there should be read by people who want to know about some of the impact Zygmund had on the development of mathematics in this century.

Zygmund was a gentle man, always looking for the best in others. To quote from the paper on his students,<sup>2</sup> Zygmund told one of his students, "Concentrate only on the achievements, and ignore the mistakes. When judging a mathematician you should only integrate  $f_+$  (the positive part of his function) and ignore the negative part." This is wise advice from a very wise man.

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<sup>1</sup> Published by the American Mathematical Society in 1989; see pp. 343–369.

<sup>2</sup> Published by Kluwer Academic Publishers in 1989.