Stephan Ruscheweyh 1944–2019

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Stephan Ruscheweyh was born in Zwickau on April 30, 1944. Stephan began his academic studies in Bonn, receiving his Diploma in Mathematics in 1968, and less than one year later his Ph.D., under the supervision of Ernst Peschl and Karl Bauer. His habilitation followed in 1972. His first position was an associate professorship at the University of Dortmund, followed by a full professorship at the University of Würzburg, where he was active until his retirement in 2012. During his retirement, Stephan continued his activities in Würzburg as the second director of the

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“Interdisciplinary Research Center for Mathematics in Science and Technology (IFZM)”. Stephan passed away on July 26, 2019.

Shortly after having initiated his academic career in Dortmund, Stephan started what may be called his trademark, namely international co-operation with emphasis on supporting mathematicians in developing countries. Accordingly, in August 1973 he went to Afghanistan, to serve in a visiting position at the University of Kabul until early 1975, and again in 1977–1980. Two decades later, in 2002, after the official end of the Taliban regime, he returned to the country, then almost yearly, in order to bring back science and mathematics there, in particular in Kabul and in Herat. His activities in that country have been of utmost importance to colleagues and students whose chances to make international contacts had been negligible.

During the period from 1980 to 2002, when contacts to Afghanistan were out of reach, Stephan’s international activities with respect to mathematical co-operation were mainly directed to India, Chile, Canada and the USA. Although it is well known that India had been important for Stephan for almost 40 years, we wish to point out Stephan’s links to Valparaiso in Chile, where he was a mathematical visitor more than twenty times, spending three years there in the late 1980s. Together with one of his closest professional friends, Luis Salinas, he wrote more than twenty papers. Moreover, a reason to give priority to Valparaiso in this obituary is that the idea of the “Computational Methods in Function Theory” (*CMFT*) conferences originated there, while Stephan worked on this project from 1987, resulting in the first *CMFT* conference in Valparaiso in 1989. Since then, *CMFT* conferences have been organized eight times, all in different countries, with a gradually increasing number of speakers and participants. Thanks to Stephan, the leading idea of these *CMFT* conferences, to assist creation and maintenance of contacts between mathematicians from diverse cultures, and to promote participation of colleagues from developing countries is thriving and, hopefully, will continue to flourish. To add a personal note, the third author (IL) came into close contact with Stephan in 2000, when it was decided to organize the 5th *CMFT* conference in Joensuu, Finland. Since then, he has learned to appreciate how Stephan’s activity, international contacts and experience could be relied by the organizers of the subsequent *CMFT* conferences. The authors of this obituary now propose and hope that the next *CMFT* might be organized as the memorial conference to Stephan.

Stephan also had a key role in starting the journal under the same acronym, *CMFT*, in 2001. Since then, *CMFT* has been an important platform for mathematical research where connections between computation and function theory have been investigated, thanks to the chief editors Stephan, Ed Saff and Doron Lubinsky, and the technical editor of the journal, Richard Greiner. Presently *CMFT* is published by the Springer Verlag, with an increasing amount of papers being considered.

The major role Stephan played in international exchange did not stop him being very active in the German function theory community as well. It was his initiative to start the yearly meetings “Tag der Funktionentheorie” of German function theorists. The first such meeting took place in Würzburg in 1983, followed by others. Since support of junior researchers was very important to Stephan, he always made sure to give young colleagues the possibility to present their work here. There was always also some international participation in these meetings, in particular from foreign mathematicians

who were in Germany for some scientific exchange. Many of those participants were in Germany in order to visit Stephan in Würzburg. “Tag der Funktionentheorie” were not the only conferences that Stephan organized in Germany. There were various other meetings as well that he organized in Würzburg, and he was also an organizer of workshops in Oberwolfach. When possible topics and organizers of the next function theory workshop were discussed, Stephan’s advice was always sought. Indeed, he usually was the initiator and driving force of such discussions. In short, Stephan was one of the central figures in German function theory. As a personal remark by the second author (WB), I also enjoyed Stephan’s support of junior researchers, and my first conference talk was on a Tag der Funktionentheorie. I also had many contacts with Stephan in the frame-work of a grant from the German–Israeli Foundation for a period of eight years.

To proceed to Stephan’s mathematical achievements, he became prominent in the mathematical community in 1973 when he and Terry Sheil-Small proved the Pólya–Schoenberg conjecture that stems from 1958. The conjecture asserted that the algebraic operation of convolution, $h * g$, of two analytic functions h and g on the unit disc $\mathbb{D}$ would preserve the convex property of the individual images of $\mathbb{D}$. They actually proved much more, including Wilf’s even stronger subordination conjecture. A key lemma in the proof was an earlier result of Stephan determining conditions on g and h in the linear operator, $L(P) = (g * Ph)/(g * h)$, to map a function P of positive real part into the right half plane. This key lemma has been used by many authors to show that convolution with convex functions preserves several geometric properties of the image.

The Pólya–Schoenberg conjecture is not an isolated result, having been immediately incorporated into research monographs on univalent functions. The techniques developed for its proof have been shown to be extremely powerful and useful for a number of other results, in particular in connection with polynomials and Grace’s infamous apolarity theorem and in connection with a far-reaching extension of convexity theory called duality. In co-operation with other colleagues and some of his Ph.D. students, Stephan developed a beautiful, coherent theory of convolution the first results of which are explained in his book “Convolutions in Geometric Function Theory”. This theory is still very much a subject of research and its limits are not yet determined. Stephan had a true gift of understanding and explaining the interdependence of algebra, analysis, and geometry using tools from convolution theory, differential equations, special function theory, operator theory and approximation theory.

Stephan has been an outstanding mathematician who produced in his 175 publications, including two research monographs, a substantial number of new results that have been simple enough to be explained to others without causing headaches. Moreover, many of his proofs are clever, not technical and really smart. In addition to his research achievements, Stephan was a top class teacher, as can be witnessed by the audience (including the present authors), as well as the 18 Ph.D. students from six nationalities he supervised.

As a personal note from the first author (RB), I first met Stephan when he was giving a series of lectures at a NATO conference in Montreal in 1981. He then recalled my name and some of my results while making use of his key lemma (mentioned

above). As a consequence, more than half of my several visits to Europe, Asia and South America were at Stephan's invitation.

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