

PREFACE

The present volume is a tribute to Fred Gehring on the occasion of his 80th birthday. All articles included were carefully refereed. They were solicited and processed by me and my colleagues Lizhen Ji and Juha Heinonen (†1960–2007). We were fortunate to get a positive response to every single request to contribute to this collection.

It is appropriate to recall some highlights of Fred's personal and professional life. More detailed information can be found in the volume¹ that appeared in celebration of his 70th birthday. It contains a biographical sketch written by P. Duren and a survey of Fred's scientific achievements by J. Heinonen and B. Palka.

Fredrick William Gehring was born in Ann Arbor, Michigan, on August 7, 1925. He grew up in Ann Arbor and received a bachelor's degree in mathematics and in electrical engineering in 1946 and a master's degree in mathematics 1949 from the University of Michigan. With a Fulbright Fellowship he went to Cambridge (England) where he received his PhD under the supervision of J.C. Burkill in 1952. While at Cambridge Fred met his future wife Lois. They were married in 1953 (and have been so for more than half a century!). They have two sons, Kalle and Peter, and two grandchildren.

Fred was a Benjamin Pierce Instructor at Harvard from 1952 to 1955. He then returned to the University of Michigan as a faculty member, where he spent a long and distinguished career. He was chairman of the Department of Mathematics from 1973–75, 1977–1980, and 1981–1984. Ultimately he received one of the highest university honors by becoming T.H. Hildebrandt Distinguished University Professor in 1987. He retired in 1997.

Fred has served the mathematical community in many capacities. Over the years he has provided his expertise on various professional committees and has been on the editorial boards of numerous mathematical journals and several publishers (notably for Springer's Graduate Texts in Mathematics series).

Fred has received many honors and awards. He was invited speaker at the International Congress of Mathematicians (ICM) three times (1966, 1974, 1986). He has been a member of the American Academy of the Arts and Sciences and the National Academy of Sciences since 1989, and a Foreign Member of the Finnish Academy of Sciences since 1974 and of the Royal Norwegian Society of Sciences and Letters since 1996. One of his more recent awards, received in 2006, is the Steele Prize of the American Mathematical Society for lifetime achievement.

Fred has published well over 100 journal articles making important contributions notably to classical complex analysis, quasiconformal mappings, Teichmüller theory, harmonic analysis, and Kleinian groups. He credits a research visit² to Helsinki in 1958–1959 as a seminal moment in his scientific development. At that time Fred learned about quasiconformal mappings and soon started publishing on this subject,

¹“Quasiconformal Mappings and Analysis. A collection of Papers honoring F.W. Gehring”, Eds. P. Duren, J. Heinonen, B. Osgood, B. Palka, Springer, New York, 1997.

²See O. Lehto's article in the volume cited above for an account of this visit.

in particular on the theory of quasiconformal mappings in space. This area and its many ramifications constitute the center of Fred's scientific work. All three of his contributions to the Proceedings of the ICM are on quasiconformal mappings.

Highlights of his work and some of his main results are:

- The proof that the metric definition of quasiconformality implies Sobolev regularity of the mapping.
- Solution of extremal problems for condensers in space and applications to the sharp Hölder regularity of quasiconformal mappings in higher dimensions.
- A non-smooth version of a classical theorem by Liouville: 1-quasiconformal mappings on n -dimensional Euclidean space, $n \geq 3$, are Möbius transformations.
- The study of normal family properties of uniformly quasiconformal mappings in higher dimensions.
- Investigations on mapping problems for 3-dimensional quasiconformal mappings (joint work with J. Väisälä).
- Fundamental work on the area distortion problem of plane quasiconformal mappings (joint work with E. Reich).
- Higher integrability of quasiconformal Jacobians (*Acta Math.* **130** (1973), 265–277). Arguably, this can be considered as Fred's most important paper. It has sparked a whole development of “self-improving” properties in harmonic analysis.
- A negative answer to a long-standing conjecture by L. Bers: The universal Teichmüller space is not dense in the space of Schwarzian derivatives of functions analytic and univalent in the lower half-plane.
- Introduction of the concept of a “convergence group” (joint work with G. Martin). This work is part of a long series of papers starting in the late 1980s investigating the geometry of Kleinian groups and the identification of hyperbolic lattices of smallest co-volume.

Fred's mathematical work is aptly assessed by the citation for the Steele Prize:

For over fifty years F. W. Gehring has been a leading figure in the theory of quasiconformal mappings.... Largely because of Gehring's work, the theory of quasiconformal mappings has influenced many other parts of mathematics, including complex dynamics, function theory, partial differential equations, and topology.... Gehring's mathematics is characterized by its elegance and simplicity and by its emphasis on deceptively elementary questions which later become surprisingly significant.

Fred's impact in the scientific community goes far beyond his research and service contributions. His influential role in my own academic career is a typical example. I first met Fred as a young scholar at an Oberwolfach meeting in 1992. During this meeting he invited me to come to Ann Arbor as a research visitor which I did the following year. The experiences in this new and stimulating environment led to an important turning point in my scientific development. Many others like me have benefited from Fred's generous and sympathetic mentorship. To let the numbers speak: Fred has had 29 PhD students and has been the sponsor of more than 40 postdoctoral fellows visiting the University of Michigan.

For many of his peers and his younger colleagues Fred has been a role model in his attitude to mathematics and to life. He will be an inspiration to all of us in years to come!

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