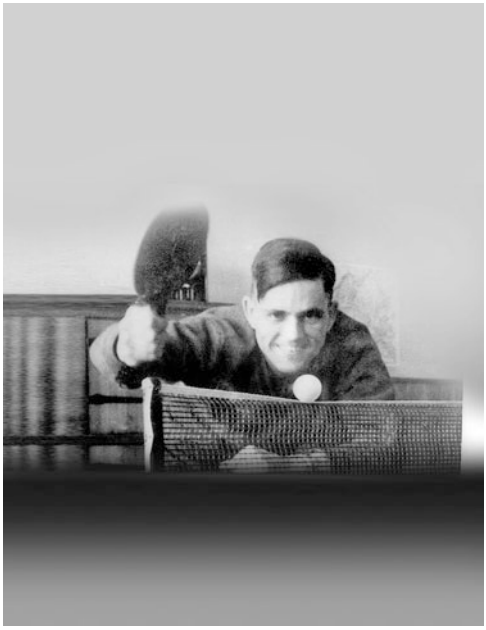
Preface



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This volume is a tribute by several generations of proof theorists to Gerhard Gentzen, one of the greatest logicians ever to whom we owe the most profound investigation of the nature of proofs since Aristotle and Frege. The immediate stimulus for its inception was Gentzen's 100th birthday in 2009 which was celebrated with a conference in Leeds and a workshop in Coimbra at which most of the contributors to this volume spoke.

Gentzen has been described as logic's lost genius[1] whom Gödel sometimes called a better logician than himself.[2] It could be said that Gentzen and Gödel arrived, each in their own exquisite manner, at opposing extremes of a spectrum. Gödel found a very general negative result to the effect that no system embodying a correct

[1] E. Menzler-Trott: *Logic's Lost Genius: The Life of Gerhard Gentzen* (AMS, Providence, 2007).

[2] G. Kreisel: Gödel's excursions into intuitionistic logic, in: *Gödel remembered*, (Bibliopolis, Napoli, 1987) p. 169.

amount of number theory can prove its own consistency by transferring the trick of the "Liar's Paradox" from the context of truth to that of provability. Gentzen, on the other hand, established the positive result that elementary number theory is consistent, using at some crucial point the well-orderedness of a certain ordering called ε_0 that sprang from Cantor's normal form (for presenting ordinals). He also gave a direct proof that the latter principle is not deducible in this theory, thereby providing an entirely new proof of a mathematical incompleteness in number theory.

Gentzen can be rightly considered to be the founding father of modern proof theory. His sequent calculus and natural deduction system beautifully explain the deep symmetries of logic. They underlie modern developments in computer science such as automated theorem proving and type theory. This volume's chapters by leading proof-theorists attest to Gentzen's enduring legacy in mathematical logic and beyond. Their contributions range from philosophical reflections and re-evaluations of Gentzen's original consistency proofs and results in proof theory to some of the most recent developments in this exciting area of modern mathematical logic.

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[3] http://www.personal.leeds.ac.uk/~matptw/.

[4] http://www.mat.uc.pt/~kahle/gentzen/.

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