Foreword

Teichmüller theory is today one of the most active research areas in mathematics, with a very wide range of applications in several fields, including Riemann surface theory, hyperbolic geometry, low-dimensional topology, several complex variables, algebraic geometry, arithmetic, partial differential equations, dynamical systems, representation theory, symplectic geometry, geometric group theory and mathematical physics. This Handbook project in several volumes arose from an attempt to present the various aspects of Teichmüller theory with its relations to all the other research fields mentioned.

The present volume, Number IV in the series, is divided into five parts, namely:

Part A: The metric and the analytic theory, 4

Part B: Representation spaces and generalized structures, 2

Part C: Dynamics

Part D: The quantum theory, 2

Part E: Sources

Parts A, B and D are sequels of parts carrying the same name in previous volumes of this Handbook. Part E, entitled *Sources*, has a new character in the series; it contains the translation together with a commentary of an important paper by Teichmüller which is almost unknown even to specialists of the subject. We hope that making available this translation together with the commentary will give an impulse to new ideas and will help putting the theory in a broader perspective.

Most of the chapters in the present volume are expository, and written by experts who have a broad view on the theory, but several chapters also contain new and important results. Together with all the other subjects that were treated in the previous volumes, this constitutes an overview of quite a large number of beautiful ideas. The topics presented in this volume involve several areas of mathematics and I do not exclude any other area in future volumes.

This volume contains surveys on the Weil–Petersson metric, on the geometry associated to simple closed curves on surfaces, on the curve complex and on its relations to buildings, on the arc complex and the related operad structure, on extremal length, on holomorphic families, on various boundary structures, on infinite-dimensional Teichmüller spaces, on moduli spaces of affine structures, on higher Teichmüller theory, on quasi-conformal mappings in higher dimensions, on the Teichmüller theory of iterations of rational maps of the two-sphere, on the dynamics of the mapping class group actions on Teichmüller spaces of surfaces of infinite type and on quantization.

Once more, I am grateful to Irene Zimmermann for her excellent work, and to Manfred Karbe and Vladimir Turaev for their permanent interest and support. I would

also like to thank the 24 contributors of this volume for a fruitful collaboration. We all hope that this series will be a useful reference to the whole mathematical community.

Strasbourg, April 2014 Athanase Papadopoulos