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Preface

In order to speed up doctoral education in Germany the "Deutsche Forschungsgemeinschaft" (DFG, German Research Association) in the late 1980s developed a new funding concept for graduate programs called "Graduiertenkollegs". Groups of university teachers could join together and submit proposals for doctoral studies within certain areas of research. If funded, the program would supply scholarships for doctoral students including means for travel, literature, scientific guests, meetings, and schools. The scholarships would allow doctorands to concentrate on their doctoral studies without the usual teaching duties and to obtain their degree in a much shorter period of time.

It was the idea of *Martin Aigner* to join efforts of mathematicians and computer scientists in the newly reunified Berlin and to apply for a graduate program within discrete mathematics and theoretical computer science. The final proposal was submitted by researchers from the three universities of Berlin, Free University, Humboldt-University, and Technical University, and the then still existing Academy of Sciences of the German Democratic Republic. The specific areas covered were geometric pattern recognition, constructive approximation, complexity theory, combinatorial optimization, graph theory, computational combinatorics, coding theory, and group theory. The proposal was accepted by the DFG, the program was named "Algorithmische Diskrete Mathematik" (Computational Discrete Mathematics), and Emo Welzl was elected as its first speaker. The program started with the first four doctorands on October 1st, 1991.

The program was extended twice by the DFG and ended in September 2000 after the maximal possible runtime of nine years. Twenty-five of the students funded obtained their doctoral degree, most of them within a time period significantly below average and many of them even within the standard two and a half years of funding by the program. All in all during the last years, discrete mathematics and algorithmics in general have been flourishing within Berlin mainly due to the existence of the graduate program.

In order to enhance contact and cooperation between the various research areas of the members of the program it had been decided at the beginning that there should be a weekly meeting on Monday afternoons during semesters. Part of this meeting consists of a 60 to 90 minute tutorial lecture by faculty members of the program or selected guests. These lectures should be understandable not only to specialists but to all members of research groups involved in the program. Still, they should be at a high scientific level including recent research results within the different fields of the program. They have turned out to be very popular and very fruitful for all groups involved including the faculty members of the program who use the opportunity to learn about the research areas of their colleagues. In order to make the material of these lectures available to a larger public we created this booklet containing twelve selected lectures held within the graduate program. It covers the whole range of areas represented

in the program including combinatorics, graph theory, coding theory, discrete and computational geometry, optimization, and algorithmic aspects of algebra. Particularly intriguing are the nonobvious connections between different areas such as combinatorics, linear algebra, discrete geometry, and graph theory in the contribution by Martin Aigner; algebraic computing and graph theory in the one by Günter Rote; or discrete geometry, graph theory, and coding theory in the one by Günter M. Ziegler.

A preliminary version of this booklet was published internally on the day of celebration of the end of the old graduate program and the start of a new one called "Combinatorics, Geometry, and Computation" which is a European graduate program of the same research groups together with partners at ETH Zurich and other European institutions.

Berlin, June 1, 2001 Helmut Alt

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