

Preface

The Southwest Center for Arithmetic Geometry (SWC) was founded in 1997 by a group of seven mathematicians working in the southwest United States, and has been continuously supported by the National Science Foundation since that time. In the beginning, the SWC served as a true *center* for Arithmetic Geometry in the Southwest, but survives today in name only, having been subsumed by its principal activity, the *Arizona Winter School* (AWS).

The AWS was started with the ambitious goal of creating an intense and immersive workshop in which graduate students—especially those who may not be studying at traditional centers of number theory—would work under the guidance of leading experts to solve research-level problems at the forefront of the field. The very first school was held in the Spring of 1998 under the title “Workshop on Diophantine Geometry Related to the ABC Conjecture.” In the twenty-one years that have followed, the AWS has been held annually each March on a different topic in arithmetic geometry and related areas, and has become a pillar of graduate education and training in these subjects throughout the country and abroad.

Over the years, the Arizona Winter School model has been adjusted and refined to meet the needs of an ever-growing and increasingly diverse audience: the five-day meeting, organized around a different central topic each year, now features a set of four lecture series by leading and emerging experts. A month before the school begins, each speaker proposes one or more research projects related to their lectures, and is assigned 10–15 graduate students who will work on these projects. At that time, speakers also provide detailed lecture notes for their courses. During the school, students attend lectures daily from 9am to 5pm, and work each evening (often into the early hours of the morning!) with speakers and designated assistants on these research projects. Students not assigned to these *research project groups* have the option to join one of two *problem sessions* devoted to solving advanced exercises related to the lecture series, or one of four *study groups* which focus on understanding the course lecture notes in detail; these additional activities are supervised by young researchers and allow students not assigned to one of the research projects to meaningfully engage with the workshop material on many levels. On the last day, the students from each research project group present their work to the whole school. The result is an extremely focused and immersive five days of mathematical activity for all.

This volume is comprised of the lecture notes which were prepared for the twentieth Arizona Winter School on “Perfectoid Spaces,” held March 11–17, 2017 at the University of Arizona in Tucson, and attended by over 367 participants, making it the largest Winter School to date. The speakers were Bhargav Bhatt, Ana Caraiani, Kiran Kedlaya, and Jared Weinstein. We are greatly indebted to these

authors for their hard work in making both the twentieth AWS and this proceedings volume a reality. Peter Scholze gave opening and closing lectures at the Winter School, which provided historical background as well as insights into his pioneering efforts and visions for the future of the subject, and we thank him most heartily for furnishing the introduction to this volume. We extend our sincere gratitude to the anonymous reviewers for their expert and careful readings of the articles, and for the valuable feedback they provided. We thank the National Science Foundation for their longstanding and continued support of the Arizona Winter School, the Clay Mathematics Institute for their partnership in organizing the 2017 AWS, and the University of Arizona Department of Mathematics for their support. Finally, we owe a great deal to the other members of the *Southwest Center*, both past and present, for their effort, perseverance, and vision in running the Arizona Winter School for more than twenty years, and for helping it to become the one-of-a-kind workshop that it is.

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