

Preface to the English Translation

In France, some students follow special curricula during the first 2 years of their superior formation, in “classes préparatoires.” There, an intensive training is organized for the entrance examinations to teaching institutions in science or engineering, the so-called “grandes écoles.”

Every May, one of those “great schools,” École Polytechnique, organizes a 2-day mathematical conference with lectures given by professional mathematicians and addressed to mathematics teachers of “classes préparatoires.” Each year, the organizers choose a special theme.

In the beginning of 2011, Pascale Harinck, Alain Plagne, and Claude Sabbah invited me to give one of those lectures. The theme of that year was “Histoires de Mathématiques.” This title has an ambiguity in French, as it may be understood both as “History of Mathematics” and “Stories about Mathematics.” I chose to respect this ambiguity by speaking about the history of mathematics and at the same time by telling a story. The subject of this story was suggested to me by Claude Sabbah in his invitation message: “the notion of genus in algebraic geometry, arithmetic and the theory of singularities.”

I accepted because I saw in the genus one of the most fascinating notions of mathematics, in its rich metamorphoses and in the wealth of phenomena it involves. It may be seen as the prototype of the concept of an invariant in geometry. Preparing the talk and writing the accompanying text for the proceedings to be published at the end of the same year appeared to me as an excellent opportunity to learn more about the development of this notion.

At that moment, I could not have imagined that navigating through the original writings of the discoverers would lead me to a book-length text! In it, I followed several of the evolutionary branches of the notion of genus, from its prehistory in problems of integration, through the cases of algebraic curves and their associated Riemann surfaces, then of algebraic surfaces, into higher dimensions. I had of course to omit many aspects of this incredibly versatile concept, but I hope that the reader who follows me will continue this exploration according to her or his own taste.

I am not a professional historian of mathematics, but I love to understand the development of mathematical ideas from this perspective. Such an understanding

seems essential to me both for doing research and for communicating with other mathematicians or with students.

This book is a slightly expanded translation of the original French version [155]. I corrected a few errors; I reformulated several vague sentences; I added some explanations, figures, or references; and I reorganized the index. I also added two new chapters, one about Whitney's work on sphere bundles and another one on Harnack's formula relating the genus of a Riemann surface defined over the reals to the number of connected components of its real locus.

Acknowledgments I took great advantage from the teamwork leading to the book [52], especially the ensuing contact with writings of the nineteenth century. I want to thank all my co-authors. I am also keen to thank Clément Caubel, Youssef Hantout, Andreas Höring, Walter Neumann, Claude Sabbah, Michel Serfati, Olivier Serman, and Bernard Teissier for their help, their remarks, and their advice. I am particularly indebted to Maria Angelica Cueto for her very careful reading of the first version of my English translation and her advice for improving it. I am also very grateful to the language editor Barnaby Sheppard. Finally, I want to thank warmly Ute McCrory for having raised the idea to publish this text as a book in the History of Math subseries of Springer Lecture Notes in Mathematics.

Villeneuve d'Ascq, France

Patrick Popescu-Pampu

What is the Genus?

Popescu-Pampu, P.

2016, XVII, 184 p. 20 illus., Softcover

ISBN: 978-3-319-42311-1