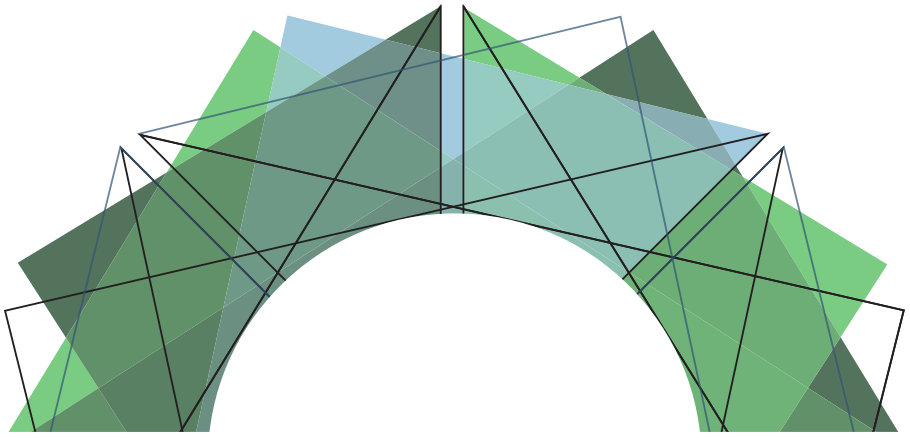
Bridges 2020

Mathematics | Art | Music | Architecture | Education | Culture

Conference Proceedings



BRIDGES 2020

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Contents

Short Papers

Workshop Papers

Preface

Welcome to the 23rd annual Bridges Conference! This year, the plan was to travel to Helsinki, the sustainable capital of Finland, a vibrant seaside city of beautiful islands and great green urban areas. Helsinki marches to a wonderful and unique beat of its own with dynamic food, design, architecture—and sauna!—scenes. In collaboration with Aalto University, University of Helsinki and University of the Arts Helsinki, the conference was to be held at the Otaniemi campus of Aalto University, a crown jewel of Finnish architecture, in Espoo, Finland. Other conference activities were scheduled for the University of Helsinki, the National Museum of Finland, and Lake Tuusulanjärvi. Unfortunately, the coronavirus pandemic forced us to cancel all in-person events. This year we will share our innovations and excitement with each other online. However, we are committed to visiting Helsinki, and we have already begun preparations for Bridges 2021 in Helsinki and Espoo, 2–6 August 2021!

This year's Bridges Program Chair is Carolyn Yackel. She coordinated an international program committee of over 75 experts, who provided extensive reviews and editorial comments on submissions. Carolyn also served as chair of the regular papers track, while Bob Bosch chaired the short papers track, and Eve Torrence and Kristóf Fenyvesi co-chaired the workshop submissions. Great thanks goes to the program committee whose work enriches the field and makes the conference and proceedings possible. Special thanks to Art Exhibition chairs Robert Fathauer and Bruce Torrence, Poetry Reading chair Sarah Glaz, Short Film Festival chair Bianca Violet, and Math + Fashion Show chair Susan Goldstine. Thank you to Kerry Mitchell for designing the cover art.

The 2020 Bridges proceedings includes 4 invited papers, 39 regular papers, 35 short papers, and 8 workshop papers. The papers introduce new ways of experiencing and viewing ideas in topology, geometry, knot theory, combinatorics, and algebra. The media include origami, poetry, sculpture, music, handcraft, traditional fine arts, computer generated art, and 3D printing. Education is also represented, with papers addressing theory as well as practice. A number of papers invite the reader to work through the physical enactment of the mathematics by making or manipulating an object for themselves. The exciting variety of topics and techniques will keep readers on the edges of their seats. The enormous range of creativity of the Bridges community continues to be astounding. This complicates the task of serving on the Program Committee. We are grateful for the meticulous service of those members who graciously assist their colleagues in polishing their written work. Special thanks to Eve Torrence and George Hart for their extraordinary help. Thanks also to Doug McKenna for valuable technical assistance with formatting.

An exhibition of mathematical art has been an annual feature of Bridges since 2001. Artists participate from around the world, representing diverse cultural backgrounds. A wide variety of artistic media are represented in the exhibition, including 2D and 3D digital prints, drawing, painting, beadwork, weaving, ceramics, woodwork, stained glass, metalwork, quilting, and paper cutting and folding. Artists drew inspiration from the mathematics of fractals, polyhedra, non-

Euclidean and four-dimensional geometry, tiling, knot theory, number theory, and more. This year Robert Fathauer and Bruce Torrence served as co-curators of the exhibition. The jury considering the artworks consisted of Robert, Bruce, Taneli Luotoniemi, and Katie McCallum. The print catalog was prepared by Conan Chadbourne with cover art by Kerry Mitchell, and the art submission website was created and administered by Nathan Selikoff. Even though we weren't able to hold the physical art exhibition, Taneli Luotoniemi served as the local coordinator for the art exhibition and played a key role in planning the exhibition.

The host committee, chaired by Kirsi Peltonen, worked tirelessly on all fronts to arrange a rich experience for conference participants, which we hope to enjoy next year in Aalto. We are grateful for the contributions to the preparations to organize the Bridges 2020 conference from Aalto University, University of Helsinki and University of the Arts Helsinki. The local organizing committee was broadly represented by experts from mathematics and arts bringing versatile insight to the arrangements. We are thankful to Anna Valtonen, the Vice President of Art and Creative Practices at Aalto University, Jouko Lampinen, the Dean of the School of Science, and Nuutti Hyvönen, the Head of the Department of Mathematics and Systems Analysis for making the conference possible at Aalto. For financial support outside Aalto we are grateful to the Finnish Cultural Foundation, the Magnus Ehrnrooth foundation, The Federation of Finnish Learned Societies, the Mathematics Fund of the Finnish Academy of Science and Letters, Jan Vapaavuori, the Mayor of Helsinki, Tuula Antola, the Director of Economic Development of Espoo and Tuomas Hytönen, the Head of the Mathematics and Statistics Department of the University of Helsinki. Hanna Korhonen and her team at the National Museum of Finland had a great impact on the planning of Family Day and further collaboration. The promotional video was professionally produced by Taneli Luotoniemi and Petteri Mäkiniemi, and Taneli also designed the postcards. For administrative support we are indebted to Laura Karvonen, Karola Salminen, Maisa Rein and David Radnell.

A great deal of work went into the Bridges 2020 conference and the proceedings even though the physical conference never took place due to the worldwide coronavirus pandemic. Strikingly, participants commonly expressed that the lack of a physical conference meant missing out on the best possible exchange of ideas with their peers, including fundamental feedback on their own work and synergistic work with others, much of which takes place informally between participants. For creating an atmosphere of goodwill, sharing, and working together to further the study of mathematics and art, we thank founder Reza Sarhangi, and for upholding those values, we commend the Bridges Community itself.

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www.bridgesmathart.org