

Lecture Notes in Artificial Intelligence

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Preface

As in the case of the first two conferences (which took place in 2007 in Berlin and in 2009 at Yale University), the Third International Conference on Mathematics and Computation in Music (MCM 2011) aimed to provide a multi-disciplinary platform dedicated to the communication and exchange of ideas amongst researchers involved in mathematics, computer science, music theory, composition, musicology, or other related disciplines. MCM 2011 took place during June 15–17, 2011 at IRCAM, the Institute for Research and Coordination in Acoustics and Music in Paris, France. According to the mission of the Society of Mathematics and Computation in Music (SMCM), we welcomed original and high-quality contributions—including research papers, invited sessions or panels and tutorials—in all areas dealing with the relationships between music and mathematics. These areas include the formalization and geometrical representation of musical structures and processes, mathematical models for music improvisation and gestures theory, set-theoretical and transformational approaches, computational analysis, and cognitive musicology as well as more general discussions on the history, philosophy, and epistemology of music and mathematics.

These proceedings comprise 36 double-blind refereed papers that were accepted for presentation at the conference. Of 62 submissions received, 24 were accepted as long papers to be presented during the different thematic sessions of the conference and are included in the first section of the proceedings. As the reviewers considered some of the remaining submissions to be high-quality contributions, we proposed to the authors to reduce their papers and present them as posters. The second part of the proceedings comprises the 12 short papers selected and presented during the two poster sessions.

As in the previous conferences, we also solicited proposals for panel discussions and tutorials/workshops. One panel and three tutorials were selected and included in the conference program. The panel, entitled “Bridging the Gap: Computational and Mathematical Approaches in Music Research” was organized by Anja Volk (Department of Information and Computing Sciences, Utrecht University Institute for Logic) and Aline Honingh (Language and Computation, University of Amsterdam), with the participation of Alan Marsden (Lancaster Institute for the Contemporary Arts at Lancaster University and editor of *Journal of New Music Research*), Guerino Mazzola (University of Minnesota), and Geraint Wiggins (Goldsmiths College, University of London). Three tutorials were also organized, entitled “Reinforcement Learning and Computational Methods in Music Cognition” (by Nori Jacoby, Interdisciplinary Center for Neural Computation, Hebrew University of Jerusalem / Department of Music, Bar-Ilan University), “Maximal Even Sets” (by Jack Douthett, Central New Mexico Community College, Richard Plotkin, State University of New York at Buffalo, Richard Krantz, Metropolitan State College of Denver and Peter Steinbach, Central New Mexico

Community College), and “From Circle to Hyperspheres: When the Tonnetze go 4D” (by Gilles Baroin, University of Toulouse).

Thanks to the joint collaboration between IRCAM’s artistic and scientific directions, MCM 2011 was integrated into the institute’s most important artistic event of the season, the *Agora Music Festival*, running from June 8 to 18, 2011. The conference was thus accompanied by a series of large public scientific and artistic events organized in collaboration with some of the most important cultural and educational centers of France, such as the Centre Pompidou and Univercience (Palais de la Découverte). As a *prelude* to the conference, Univercience organized for the first time a large public conference on mathematics and music that marked the beginning of a hopefully fruitful collaboration between the researchers working at IRCAM and the scientific team of the Palais de la Découverte. The actual opening of MCM 2011 was characterized by a dialogue between two outstanding figures of music and mathematics, the renowned composer and conductor Pierre Boulez, founder and honorary director of IRCAM, and the Fields medalist Alain Connes. This dialogue, focusing on the creative process in music and mathematics, was coordinated by Gérard Assayag, director of the IRCAM/CNRS Lab and was followed by a Mathematics-Music concert organized by IRCAM’s artistic direction, featuring pieces by Daniele Ghisi (*abroad*, for soprano, ensemble, and electronics), Karim Haddad (*Ce qui dort dans l’ombre sacrée...*, for bass and electronics), György Ligeti (*Monument. Selbstportrait. Bewegung*, for two pianos), and Karlheinz Stockhausen (*Kontakte*, for piano, percussion, and tape).

The second day of the conference hosted a plenary talk by the French philosopher Alain Badiou on mathematics and esthetics, whereas computer scientist Stephen Wolfram was the invited speaker of the third day of MCM 2011, with a videoconference streamed from Boston (Massachusetts, USA) entitled “Music from the Computational Universe.” As a *postlude* to MCM 2011, a round table took place at the Palais de la Découverte around creativity in mathematics and arts, with the participation of Jean-Marc Lévy Leblond (physicist and essayist), Claude Bruter (mathematician and president of the ESMA, the European Society for Mathematics and Arts), Yves Hellegouarch (mathematician), Jean-Paul Allouche (mathematician), Jean-Claude Risset (physicist and composer), Tom Johnson (composer), and Jacques Mandelbrojt (painter and physicist). The multidisciplinary enlargement around the relationships between mathematics and other artistic disciplines also took profit from the exhibition of the French artist François Morellet at the Centre Pompidou (from March 2 to July 4) as well as the “Mathematics and Arts” exhibition organized by ESMA at the Palais de la Découverte. As a musical accompaniment of the “Mathematics and Arts” exhibition, some interactive platforms on computer-aided models in music analysis and composition were conceived and presented by Thomas Noll (ESMuC), Martin Carlé (Humboldt University), Gilles Baroin (University of Toulouse), Jérémie Garcia (IRCAM / In Situ University of Paris XI), Pierre Beauguitte (IRCAM / University Paris VI), and Benjamin Lévy (IRCAM / University of Paris VI).

MCM 2011 also inaugurated a new thematic session around a freshly published or forthcoming book whose content contributes to the understanding of the two music-theoretical and mathematical traditions that are representative of our society. This year we selected Dmitri Tymoczko's book *A Geometry of Music* (Oxford University Press), which was initially presented by the author and was then taken as the starting point for a more general philosophical and epistemological discussion on the foundational aspects of European and American maths/music-theoretical traditions.

MCM 2011 was organized under the auspices of the SMCM (Society for Mathematics and Computation in Music), the SMF (French Mathematical Society), CiE (Computability in Europe), ESMA (European Society for Mathematics and Arts), and with the financial support of the CNRS (French National Center for Scientific Research), the French Ministry of Culture, the Université Pierre et Marie Curie (UPMC), the AFIM (French Society of Music Informatics), and the SFAM (French Society of Music Analysis).

We wish to acknowledge the generous support of all IRCAM's departments in the organization of MCM 2011. We are grateful to all the invited speakers who accepted our invitation to join the conference: Pierre Boulez and Alain Connes for accepting the challenge of confronting their mutual perspectives on mathematics and music; Alain Badiou, Stephen Wolfram and all the scientists and artists who accepted to take part in the final round table at the Palais de la Découverte.

A special thanks to Sylvie Benoit of IRCAM's scientific department for helping the Program Committee with all the organizational aspects related to MCM 2011.

The Third International Conference on Mathematics and Computation in Music is dedicated to the memories of Milton Babbitt (1916–2011) and André Rietot (1928–2011), composers and music-theorists, for their outstanding contributions to the field of relationships between music and mathematics. Their ground-breaking ideas, compositional as well as theoretical, influenced generations of students and researchers up to present days.

June 2011

Carlos Agon
Emmanuel Amiot
Moreno Andreatta
Gérard Assayag
Jean Bresson
John Mandereau

MCM 2011 Organization

MCM 2011 was organized by the Music Representations team of IRCAM (STMS Lab CNRS/UPMC) in collaboration with the Centre Pompidou and Universcience.

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