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# Interdisciplinarity for the 21st Century: Proceedings of the 3rd International Symposium on Mathematics and its Connections to Arts and Sciences, Moncton 2009

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Description

Interdisciplinarity has become increasingly important for emergent professions of the 21st century yet there is a dearth of systematic studies aimed at implementing it in the school and university curricula. The Mathematics and its Connections to the Arts and Sciences (MACAS ) group places Mathematics as a vehicle through which deep and meaningful connections can be forged with the Arts and the Sciences and as a means of promoting interdisciplinary and transdisciplinary thinking traits amongst students. The Third International Symposium held by the MACAS group in Moncton, Canada in 2009 included numerous initiaves and ideas for interdisciplinarity that are implementable in both the school and university setting. The chapters in this book cover interdisciplinary links with mathematics found in the domains of culture, art, aesthetics, music, cognition, history, philosophy, engineering, technology and science with contributors from Canada, U.S, Denmark, Germany, Mexico, Iran and Poland amongst others.

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**Dedication**

**To**

**Mirabai**

**Interdisciplinary Networks for better Education in Mathematics, Science and Arts**

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Bharath Sriraman, The University of Montana

Today's young learners have borne not only the fruits of enormous progress of science and technology that marked the 20th century but also inherited the challenges surrounding complex and ill-defined real life problems that remain unsolved. Moreover, issues humanity faces such as climate change, health, environment, overpopulation, and so on are so complex that these problems can not be solved by a single person or even a single discipline. An interdisciplinary approach to teaching and learning is thus a key element for any successful educational enterprise which aims to prepare future generations to deal with the increasing complexity and interconnectivity of our world.

The significance of the topic was recognised by the International Commission of Mathematical Instruction (ICMI) that formed a Topic Study Group 21 at ICME-10, held in Copenhagen in 2004 (http://www.icme10.dk/). 19 papers published electronically as well as in book form featured a broad spectrum of studies presenting new trends and developments of the topic related issues like mathematics and visual arts, mathematics and literature, mathematics and music, mathematics and sciences in their epistemological, historical, cultural and educational international perspective. The participants at the end of ICME-10 expressed a need for deeper conceptual and experimental work on these and other related issues that resulted in the First MACAS symposium held in 2005 in Schwäbisch Gmünd, Germany hosted by Astrid Beckmann (Beckmann, 2005). Originating from the field of mathematics education, MACAS1 looked (1) to bring together researchers who share this vision of unifying the arts, mathematics, and the sciences in the school and university curricula; (2) to articulate a common research agenda; (3) to create networks of researchers with common interest; (4) to focus on creating a scholarly publication through which the work of the group may be transmitted.

Given the first success in bringing together researchers interested in connections between mathematics, the arts and sciences, this Symposium has mutated into a biennial event the second of which was held in 2007, in Odense, Denmark (with Claus Michelsen as the host). A mini Symposium was also held in 2007 within the auspices of the 9th International History Philosophy, and Science Teaching Conference in Calgary 2007 (with Bharath Sriraman as the organizer). We believe that the two Symposia and the mini Symposium helped to achieve three of the four initial goals. We did accomplish the goal of bringing together researchers who share a vision of unifying the arts, mathematics, and the sciences in the school and university curricula. We now have a network of researchers with some common interests. The Symposia proceedings were the start of creating a scholarly publication through which the work of the group is transmitted. However we have not accomplished the goal of articulating a common research agenda. We think that the Symposia were best characterized by the word diversity, which shows the need for the development of a common theoretical framework under which researchers can actively pursue the myriad ideas. There is also a need for joint empirical investigations which operationalize, model and study the rich ideas presented in Schwäbisch Gmünd and Odense, and Calgary initiating further collaboration, networking and results in joint research reports for the next Symposia (Sriraman, Michelsen, Beckmann & Freiman, 2007).

The 3rd MACAS Symposium took place in Moncton, New Brunswick, Canada from May, 21-23, 2009 (hosted by Viktor Freiman and Nicole Lirette-Pitre) at the Université de Moncton, Campus de Moncton. It included 30 participants from Denmark, Germany, Mexico, Poland, USA, and Canada interested in connections between mathematics, the arts and sciences to get together in order to exchange their research results and to continue working together on the collaborative research agenda. The Scientific Committee was composed of Viktor Freiman, Bharath Sriraman, Astrid Beckmann, Claus Michelsen, and Nicole Lirette-Pitre who was also responsible for the development of the website (http://www0.umoncton.ca/freimanv/macas3/) with Samuel Blanchard.

The Symposium was a part of the project *Interdisciplinary Networks for better Education in Mathematics, Science and Arts* funded by the *Canadian Social Sciences and Humanities Research Council* as part of its program for the International Opportunities Fund in 2008. It drew other partners and collaborators, such as the *New Brunswick Innovation Foundation* (NBIF), the *Centre de Développement et de la Recherche en Éducation* (CRDE) de l'Université de Moncton and the *Association pour l'Avancement pédagogique des TIC en Atlantique* (APTICA) For the first time the MACAS Symposium was a part of a larger SMART (Linking Science, Mathematics, and Arts, http://www0.umoncton.ca/freimanv/smarts/) conference in which two other groups, the CRYSTAL Atlantique Research Center (www.crystalatlantique.ca) and ACASE association (http://www.unb.ca/fredericton/science/physics/acase/) took part.

The CRYSTAL Atlantique (Center for Research in Youth, Science Teaching and Learning) was founded in 2005 by the Canadian *Natural Sciences and Engineering Research Council* (NSERC). It fosters a research collaboration created to study and promote the culture of science/ technology and mathematics. In collaboration with the New Brunswick and Nova Scotia Departments of Education, CRYSTAL Atlantic brings together an English and Francophone research team consisting of educators, scientists, experts in related disciplines, and community organizations. Our first research focus is informal learning and creating a culture of science, technology and mathematics. Each year the entire CRYSTAL Atlantique research team meets to share what they have learned with one another and the public the Colloquium.

The ACASE (Atlantic Canada Association of Science Educator/ Association des enseignantes et des enseignants de sciences de l'Atlantique) is an organization interested in collaborating to improve science education at all levels in Atlantic Canada, primarily through professional development. It supports the improvement of science teaching and learning across a wide spectrum of professional sections - elementary school, middle level, high school, post secondary, informal and teacher education. In order that all science educators find in ACASE/AEESA a welcome home for collaborative initiatives to improve science education, equality between the professional sections and between the provincial chapters is a guiding organizational principle. Collaborative activity across professional boundaries and across provinces is encouraged and facilitated by ACASE/AEESA through its annual conferences, where participants can share best practices and new ideas for the teaching of science.

The event was a tremendous collective effort of the local organizing team supported by the Faculté des sciences de l'éducation de l'Université de Moncton in collaboration with the Unviersity of New Brunwick and the New Brunswick Ministry of Education that allowed a fruitful exchange between researchers and teachers about innovative interdisciplinary practices. We would like to thank all the team and partners for the success of the conference

and particularly our enthusiastic and dynamic student assistants Jean-Luc Audet, Samuel Blanchard, Chantal Gallant, Nicolas LeBlanc, and Dominic Manuel. Special thanks to Evguenii Vichnevetskii, Associate Researcher at the Université de Moncton for the development of our SMART website and to the Direction des technologies de l'Unversité de Moncton for hosting it.

The papers in the proceedings were reviewed by the organizing team as well as a panel of external reviewers inorder to determine selection. Participation in the Symposium was determined on the basis of the accepted paper.

The collaborative work will continue over the next two years and the next (Fourth) MACAS Symposium is scheduled for 2011.