

HPM 2024

PLENARY LECTURE ABSTRACTS

(listed by theme)

- **Theme 1:** Theoretical and/or conceptual frameworks for integrating history in mathematics education

[David Guillemette](#), Université du Québec à Montréal (Canada)

An Ethical Perspective on the History of Mathematics in Mathematics Education

In this plenary talk, I will introduce a perspective in which ethics is at the core of the reflection on the history of mathematics in mathematics education. Considering and discussing various empirical and theoretical studies in the HPM literature, I will present a theoretical positioning inspired by the writings of Bakhtin, Levinas and Freire, along with our recent works with pre- and in-service mathematics teachers grounded in this approach. Focusing primarily on teachers' education, this ethical perspective invites me to see the engagement with the history of mathematics as an opportunity to experience *otherness*, in which sensitivity to epistemology, to fundamentals and purposes of mathematics education and to social and political issues in mathematics education develops. In this exploration, I will discuss especially the themes of responsibility, engagement and dialogicality. Moreover, I will highlight how pedagogical goals, ways of engaging with the history, teachers' and learners' roles, and challenges appear from this light, as well as some possible paths for research in terms of research problems and methodology.



David Guillemette is a professor of mathematics education at Université du Québec à Montréal, Canada. In the context of teachers' education, his research focuses mainly on otherness and ethics. He is interested in the cultural and historical dimension of mathematics, and in social and political issues in mathematics education.

- **Theme 2:** History and epistemology in students' and teachers' mathematics education: Classroom experiments and teaching materials

[Aline Bernardes](#), Universidade Federal do Estado do Rio de Janeiro (Brazil)

History in Teachers' Mathematics Education: Problematising Concepts, Views on Mathematics, and its Learning and Teaching

In recent decades, we have seen the integration of history into students' and teachers' mathematics education flourish, yielding numerous teaching proposals and materials. In this presentation, I will explore some examples of how I have promoted this integration within teacher education, grounded in the theory of commognition. Through the notions of commognitive conflict and metadiscursive rules, mathematical practices from the past are explored to problematise concepts, views on mathematics (e.g., mathematics is universal, immutable, only brilliant minds can engage in it), and views on how it is learned and taught. Within this framework, the use of primary sources is deemed essential. To conclude, I will share the findings of a recent investigation into mathematics textbooks and address some of the challenges we have been facing in Brazil to promote this integration.

Aline Bernardes is a Professor in the School of Mathematics at the Federal University of the State of Rio de Janeiro (UNIRIO), Brazil, where she works in the Undergraduate Mathematics Education Program and the Professional Master's Program for Mathematics Teachers (PROFMAT).

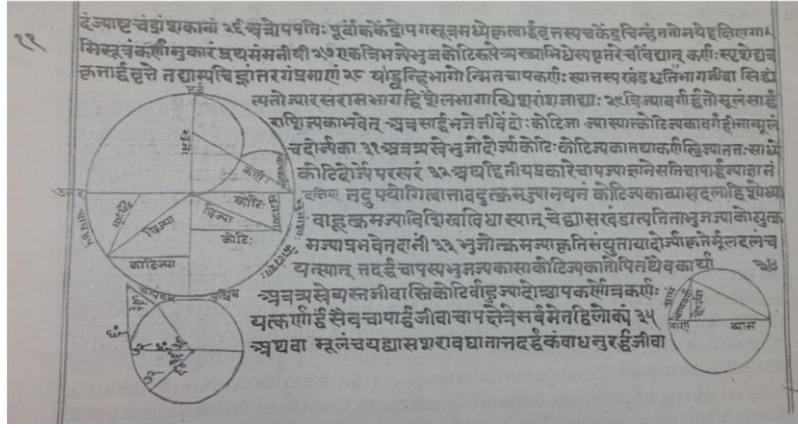
Her main research interest lies in integrating the history of mathematics with mathematics teaching, exploring ways to achieve this integration through a commognitive lens.



- **Theme 3:** Original Sources in the classroom and their educational effects.

[Clemency Montelle](#), University of Canterbury (New Zealand)
Historical Tangents! Original Sources from Trigonometry Texts throughout History

Trigonometry, as we understand it today, carries a rich and intricate backstory that spans across various civilizations over more than two thousand years. Despite its neat presentation in modern mathematics curricula, it is often a challenging topic for students who meet it as a set of abstract analytic functions ultimately deriving from ratios of quantities. However, the history of trigonometry reveals a mathematical concept that, originally conceived of to address the demands of ancient astronomy, has undergone profound transformations and was central to numerous groundbreaking scientific endeavours in a wide variety of contexts. We will consider various original historical sources which testify to a more creative and geometric approach to this field, offering new perspectives to appeal to the imagination of learners to deepen their grasp of the topic.



Professor Clemency Montelle is the Tumuaki Kura | Head of School: Pāngarau | Mathematics and Statistics at the University of Canterbury, a leadership role she has held since 2020.

She is an internationally recognised research leader in the History and Philosophy of Mathematics. Author of seven books and over one hundred research outputs, her research excellence has been recognised by various awards including the Indian Satish Bhatnagar prize and the New Zealand Mathematics Society Research Prize.

Her research examines the mathematical achievements of early cultures and is carried out by the examination and analysis of primary source material in Sanskrit, Arabic, Greek, Latin, and Cuneiform. She has authored several books in her field including Sanskrit Astronomical Tables (2019), The Sanskrit Astronomical Table Text Brahmatulyasāraṇī Numerical Tables in Textual Scholarship (2020), and Bloomsbury’s A Cultural History of Mathematics: The Medieval Age (2024).



She is passionate about educating people in the mathematical sciences, and creating a technically literate society able to address the needs of communities, fostering advances in science, technology and the social sciences. She is deeply invested in championing diversity and inclusivity in the mathematical sciences and uses her expertise in historical sources and periods to further this aim.

- **Theme 4** Mathematics and its relation to science, technology, and the arts: Historical issues and interdisciplinary teaching and learning.

[Helena Durnova](#), Masaryk University (Czech Republic)

The constructive and destructive roles of calculators in mathematics education

For a long time, calculations themselves and the ability to perform them was an intrinsic part of mathematics education. Until WWII, what we now call “mathematics” was simply called “calculations measuring.” A few decades later, the emergence of pocket calculators brought a new aid, but also a threat to the primary goal of teaching arithmetic. Operating the new device became an important skill, which had to be taught as well, but the spread of the devices led to the belief that we no longer need to learn (and hence also to teach) multiplication tables. In my talk, I will draw attention to how numerical skills were associated with mathematics, how the arrival of the computer and calculating devices shifted the core of mathematics, and how this is reflected in mathematics education.



Helena Durnová is a historian of mathematics and computing, with special interests in social history of modern mathematics and computing and in the intersections between mathematics, informatics and computing. She teaches history of mathematics and history of mathematics education at Masaryk University (Brno, CZ).

- **Theme 5:** Cultures and history of mathematics fruitfully interwoven

[Kay Owens](#), Charles Sturt University (Australia)

Co-presenters: Vagi Bino and Charly Muke

Past, Present and Future: The Fruitful Interweaving of Cultural Mathematics

Gaining a grasp on cultural mathematics in Papua New Guinea required a study of multiple sources from archaeology, linguistics, records by Europeans' first contacts, cultural artefacts, ways of living, our own lived experiences, and oral histories. Highly integrated were technology, science, folk lore, and mathematics. Together with Elders, colleagues, and students we could synthesise numerous mathematical activities involving measurements and ratios, time, number systems, engineering principles such as in cantilever balance, agricultural science, mathematical approaches to physical phenomena especially around movement and direction on water, and economic trade. Essential to understanding these mathematical practices were the strengths of visuospatial, embodied reasoning. A further exploration of linking cultural mathematics and school mathematics involved linguistic analysis with common practice. Several constraints were identified in terms of implementation together with possible ways forward.

Kay Owens was awarded her PhD in 1993 in mathematics education at Deakin University, and was Senior Lecturer at Western Sydney University before moving to Charles Sturt University in Dubbo where she is an Adjunct Associate Professor. Prior to this, Kay spent 15 years in Papua New Guinea where she held a lectureship in mathematics at the PNG University of Technology and a Head of Department position at Balob Teachers College. She has held an exchange position at Gothenburg University in Sweden and taught a Masters program at the Inter-University Institute in Macau and Visiting Scholar on several occasions at the University of Goroka.



Kay has continued her research working with colleagues in Papua New Guinea over many years with a focus on the relationships between mathematics, language and culture, and on space, geometry and measurement education. She continued her interest in visuospatial reasoning recognising the importance of ecoculture on this capability.

Having lived through many changes in PNG education, she and her colleagues have focused on mathematics and technology and mathematics education from earliest time (at least 10,000 years ago) into this current period of history recognising the history behind neocolonialism and its impact. She has held professional positions such as Vice-President of the Mathematics Education Research Group of Australasia, Editor and Executive member for The Mathematics Association of NSW, and President of the Orana cluster of the Australian College of Educators.

- **Theme 6:** Topics in the history of mathematics education
[Ysette Weiss](#), Johannes Gutenberg-Universität Mainz (Germany)
Globalization through the Lens of History of Mathematics Education

Sharing teaching experiences and learning from diverse educational traditions across cultures is a long-standing practice.

The emergence of nation states in the 19th century saw the institutionalization of school systems and corresponding teacher training, leading to the development of national education systems in the subsequent centuries. These systems were shaped by various factors, including economic conditions, military activities, ideological paradigms, and cultural traditions.

Approaches to addressing these divergences of educational systems and ways to teach mathematics have been varied. On the one hand, exchange and cooperation fostered common ground, enabling the understanding of alternative approaches and facilitating comparisons—a bottom-up approach. On the other hand, the internationalization of mathematics education, and this was unique for the school subject mathematics, gave rise to the establishment of international organizations and networks. This top-down approach, exemplified by initiatives like the Meran Reform and the New Math reform significantly influenced mathematics teaching worldwide.

In the history of education, the internationalization of mathematics education is mostly assumed to be progressive, which requires critical examination. As we will show, these narratives can be questioned both by examining historical examples and dialectically interpreting the tension between universality and cultural-historical traditions.

Ysette Weiss is a professor at the Mathematics Department of the University of Mainz (JGU) since 2010. She studied and held academic appointments in various countries — in east and west. In her research activities, she is interested in history of mathematics education and the use of history in mathematics teaching. In particular her focus lies on reforms in the mathematics teaching of the last two centuries. Moreover, she works on concept formation from the perspective of activity theory, subject matter didactics, schoolbook and text analysis, elementary mathematics and learning by discovery.



- **Theme 7:** History of mathematics in Australia and the Indo-Pacific.

[Lesley Ward](#), University of South Australia (Australia)

From the Marriage Bar to the Hypatia Scholarship: Women Working in Mathematics in Australian Universities

The first woman lecturer in the Australian mathematical sciences was appointed in 1921, almost 70 years after the first Australian university was established in 1852. Since then the proportion of women among mathematical sciences students and academic staff has gradually increased, though it has not reached 50% even at the bachelor's completion level. Why so low, and why so slow? What can we do now to create a more inclusive and equitable higher education sector that allows everyone to contribute more fully? What does the past tell us about what works? I'll outline some of the history of women working in the mathematical sciences in Australian universities, with a focus on the national Women in Mathematics Special Interest Group (WIMSIG, founded in 2012) of the Australian Mathematical Society. Drawing on that history, I'll offer insights into our evolving understanding of why women and others have been underrepresented, and the initiatives we've used to address inequity. In addition to describing the Australian historical, societal and legal contexts, I'll consider broader explanatory factors that have acted to inhibit participation of women and other underrepresented groups worldwide. Juicy topics such as the marriage bar and its impact, the female minimum wage, and the Jennifer and John correspondence study will be addressed.



Lesley Ward is a past chair of the women-in-mathematics group, WIMSIG, of the Australian Mathematical Society. She is a recipient of the Mathematical Association of America's Alder Award for Distinguished Teaching. Her research interests are in complex analysis, harmonic analysis, and industrial applications of mathematics. She earned her PhD in the US and worked in several US universities before returning to Australia to join the University of South Australia in 2006. At five institutions she has initiated and sustained women's groups focusing on peer mentoring and research talks by participants and by visiting women academic staff. With Cheryl Praeger she has recently published a chapter on the history of women in mathematics in Australia, in the US Association for Women in Mathematics (AWM) book Fifty Years of Women in Mathematics: Reminiscences, History, and Visions for the Future of AWM.