Canadian Mathematical Society Winter Meeting
December 7-10, 2012
Fairmont Queen Elizabeth Hotel, Montreal

History and Philosophy of Mathematics
Org: Tom Archibald (SFU) and Greg Lavers (Concordia)
This session is organized by the Canadian Society for the History and Philosophy of Mathematics.

Sunday December 9

14:00 - 14:20	Sylvia Nickerson (Toronto), Mathematics and the book trade in English Canada, 1850-1925, Harricana
14:30 - 14:50	Tom Archibald (SFU), Publishing Mathematics in German 1800-1825, Harricana
15:00 - 15:20	Craig Fraser (Toronto), Zermelo`s navigation problem in the calculus of variations, Harricana
15:30 - 15:50	Laura Turner (Toronto), Analytic representation and the Mittag-Leffler circle: Contrasting notions of generality in the late 19th century, Harricana
16:15 - 16:35	Mathieu Bélanger (Montréal), Menger and pointless topology, Harricana

Monday December 10

14:00 - 14:20	Hardy Grant (York), "Epistemic Cultures" and the History of Mathematics, Chaudiere
14:30 - 14:50	Bruce Petrie (Toronto), Mathematical Notations as Identifiers of Epistemic Cultures., Chaudiere
15:00 - 15:20	Greg Lavers (Concordia), Explication and Carnap's `Empiricism, Semantics and Ontology', Chaudiere
15:30 - 15:50	Jean-Pierre Marquis (Montréal), Some remarks on the abstract method in 20th century mathematics, Chaudiere
16:15 - 16:35	Oran Magal (McGill), What did we always mean?, Chaudiere

History and Philosophy of Mathematics
Histoire et philosophie des mathématiques
(Org: **Tom Archibald** (SFU) and/et **Greg Lavers** (Concordia))

SYLVIA NICKERSON (TORONTO), University of Toronto
Mathematics and the book trade in English Canada, 1850-1925

In their history of mathematics in Canada prior to 1945, Tom Archibald and Louis Charbonneau recognize that printers and publishers played an important role in the diffusion of basic mathematical knowledge in the early days of mathematical practice in Canada. A book trade, they note, is a prerequisite for mathematical culture. This paper will explore what role the book trade may have had on the educational structure and professional practice of mathematics in English Canada, from 1850 to 1925. The production of mathematical books within Canada and the range mathematical books available to Canadian students will be of interest. On the one hand, platemaking (i.e. the stereotype and electrotype printing process) allowed small printers in Canada to produce standard schoolbooks from Britain and America. On the other hand, Canadian publishers such as John Lovell and Copp Clark Co. published schoolbooks by Canadian authors such as John Herbert Sangster and James Loudon. It was also common for Canadian mathematical authors (J. C. Fields, James G. MacGregor) to seek a publisher outside Canada. What rewards came to local authors of mathematical textbooks? In what way was authorship a component of mathematical practice in Canada at this time? My examination of mathematical authors and publishers will end with J. C. Field's work on the publication of the Proceedings of the International Mathematical Congress (Toronto, 1924) at the University of Toronto Press in 1928.

TOM ARCHIBALD, Simon Fraser University
Publishing Mathematics in German 1800-1825

In the years immediately prior to the beginning of Crelle's Journal in 1826, the growing German mathematical research community adopted a variety of strategies for the diffusion of their creative work. This took place against major changes in the social and political background and in higher education. In this paper we examine the publishing practices of a selection of individuals, with attention to the varying venues, publics, and career strategies for the researchers. The investigation throws into sharp relief the importance of the appearance of a research journal for the development of mathematical research in the German-speaking world.

MATHIEU BÉLANGER, Université de Montréal
Menger and pointless topology

The talk will analyze Karl Menger's conception of pointless topology. Central to Menger's conception is the idea of defining the concept of topological space as a generalization of the real line. The analysis will emphasize that, but doign so, he put forward a geometrical conception of pointless topology and that he favored a bottom-up approach.

CRAIG FRASER, University of Toronto
Zermelo's navigation problem in the calculus of variations

Ernst Zermelo's first researches in mathematics were in the calculus of variations. His 1894 doctoral dissertation at the University of Berlin extended some of Weierstrass's methods in the theory of sufficiency. In the years which followed Zermelo's interests shifted to set theory, and his contributions to this subject would prove to be of fundamental importance. In 1931 Zermelo returned to the calculus of variations and published two papers on what is known as the navigation problem. A ship or airplane must travel under power from A to B in the face of currents or winds. The problem is to determine the trajectory that will produce the least time of transit. Zermelo's solution was based on a very special application of the techniques of the calculus of variations, in which he derived a result known as Zermelo's navigation formula. The paper will examine Zermelo's solution to the navigation problem and its reception and further development by researchers of the 1930s.

HARDY GRANT, York University, Toronto
"Epistemic Cultures" and the History of Mathematics

The sociologist Karin Knorr Cetina uses the term "epistemic cultures" for "those amalgams of arrangements and mechanisms ... which, in a given field, make up how we know what we know"; her primary focus is the laboratories of physical science. A recent workshop at the University of Toronto, organized by Josipa Petrunic, sought to explore the question to what extent (mutatis mutandis) such "mechanisms of knowledge construction" can be identified in mathematics and what historiographical significance they may have. I shall try to set out some of the attendant issues by sketching the history of changes in mathematical epistemology.

GREG LAVERS, Concordia University
Explication and Carnap's 'Empiricism, Semantics and Ontology'

Carnap's conception of an 'explication' was developed in the mid-forties, and it became central to his view of how philosophical problems can be addressed. Carnap's most widely read paper is his 'Empiricism, Semantics and Ontology' (1950, ESO hereafter), but this paper makes no mention of the notion of explication. Despite this, I argue that an understanding of Carnap's views on explication are essential for a proper understanding of ESO. Carnap states that the major aim of ESO is to justify the use of abstract objects in semantics. Discussions of ESO tend to focus on the possibility of different *frameworks* or the distinction between *internal* and *external questions*, leaving Carnap's central aim largely unaddressed. This is in part because Carnap's argument for his central claim is incredibly brief. To understand this argument requires, first, an understanding of Carnap's previous reasons for rejecting questions of semantics and ontology. Second, it requires recognizing the double role played by explication in the semantic systems for mathematics.

ORAN MAGAL, McGill University
What did we always mean?

The talk picks up on and develops some themes from Lakatos' *Proofs and Refutations*, having to do with changing definitions and 'monster-barring'. The emphasis will be on informal meta-mathematical notions that constrain the introduction of new definitions, and it will be linked with some of Wittgenstein's ideas (in *Philosophical Investigations*) about 'regulating concepts'.

JEAN-PIERRE MARQUIS, Université de Montréal
Some remarks on the abstract method in 20th century mathematics

In this talk, I will go back to the introduction of the abstract method in 20th century. I will sketch what I take to be the distinctive elements of the method, try to show how it differs from generalization in mathematics and make a tentative proposal to explain levels of abstraction in contemporary mathematic.

BRUCE PETRIE, University of Toronto
Mathematical Notations as Identifiers of Epistemic Cultures.

Mike Mahoney (1993) warned us that "The symbols and terms of modern mathematics are the bearers of its concepts and methods. Their application to historical material always involves the risk of imposing on that material a content it does not in fact possess." Historians of mathematics have, for the most part, taken these concerns to heart and follow current scholarship in historiography. *Revolutions in Mathematics* (Gillies 1992) is a text dedicated to the integration of Kuhnian historiography and the history of mathematics. Many historians of mathematics, however, have yet to be introduced to the historiography of

Karin Knorr Cetina found in *Epistemic Cultures: How the Sciences Make Knowledge* (1999) where she studies modern high energy physics and molecular biology. She advocates that the Kuhnian historiography is too narrow and proposes an alternative to the paradigm concept: epistemic cultures. Building upon a workshop talk that contrasts the two methods and evaluates the appropriateness and applicability of epistemic cultures to the history of mathematics, the author argues that there is another reason to maintain the notation and terminology of past mathematics: they are identifiers of epistemic cultures.

LAURA TURNER, University of Toronto

Analytic representation and the Mittag-Leffler circle: Contrasting notions of generality in the late 19th century

Mittag-Leffler developed the theorem which bears his name between 1876 and 1884, following his apprenticeship in Berlin under Weierstrass, whose Factorization Theorem served as the point of departure for Mittag-Leffler's work. Where Weierstrass developed a representation for entire functions which displayed their zeros and their multiplicities, Mittag-Leffler focused on the analytic representation of functions with the most extensive possible set of singularities with the aim, from at least 1877, of representing those with even infinitely many essential singularities.

To Mittag-Leffler and Weierstrass, such analytic representations, fundamental to the Weierstrassian definition of a function itself, formed the most general "unit" of analysis. Indeed, studies devoted to the representation of functions were mainstream during this period. Yet others, and Cantor in particular, saw this dependence on analytic representations as problematic. His correspondence with Mittag-Leffler illuminates a shifting understanding of what it meant to be "general", or "more general" in mathematics. In this talk, I shall discuss the concept of "generality" foundational to the Mittag-Leffler Theorem, and consider the importance of this concept to some of Mittag-Leffler's contemporaries.