Canadian Society for History and Philosophy of Mathematics

Société canadienne d'histoire et de philosophie des mathématiques

Programme

18th Annual Meeting/18e Congès Annuel
May 28-29   28-29 mai 1992
University of Prince Edward Island, Charlottetown

Program/Programme

Thursday May 28/jeudi 28 mai

All sessions will be in Robertson Library Room 105

9:15	*Craig G. Fraser*, President, CSHPM/SCHPM Welcome
	JOINT SPECIAL SESSION WITH THE CANADIAN SOCIETY FOR HISTORY AND PHILOSOPHY OF SCIENCE: ETHNOMATHEMATICS/SESSION SPÉCIALE COOPÉRATIVE **(Presider, Morning: Craig C. Fraser)**
9:25	*Craig C. Fraser* Introduction of guest speaker
9:30	*Michael P. Closs,* Guest Speaker The Ancient Maya: Mathematics and Mathematicians
10:30	TEA & COFFEE/THÉ ET CAFÉ
11:00	*Sharon Kunoff* Some Inheritance Problems in Ancient Hebrew Literature
11:30	LUNCH/DÉJEUNER (COUNCIL MEETING/RÉUNION DU COUNSEIL) (Presider, Afternoon: *J. J. Tattersall*)
1:00	*Frank F. Falvo and Harry R. Love* Pythagoras: MYSTICISM AND MATHEMATICS – The two can live in the same mind!
1:30	*W. S. Anglin* Did Euclid Prove Unique Factorisation?
2:00	*R. H. Eddy* Some Contributions of C. H. Nagel to plane Euclidean geometry
2:30	TEA & COFFEE/THÉ ET CAFÉ
3:00	*Francine Abeles* Herbrand's Theorem and the Beginning of Logic Programming
3:30	*Hardy Grant* The Certainty of Mathematics: A Minority View
4:00	*Abe Schenitzer* Examples of Teaching Mathematical Ideas

Friday May 29/vendredi 29 mai

All sessions will be in Robertson Library Room 105

REGULAR SESSION/SESSION ORDINAIRE 9:30 - 5:30
(Presider, Morning: Francine Abeles)

9:30	*Craig Fraser* The Origins of Euler's Variational Calculus
10:00	TEA & COFFEE/THÉ ET CAFÉ
10:15	*Erwin Kreyszig* Basic Ideas of Functional Analysis: Motivations, Developments, Interrelations
11:15	DISCUSSION
11:45	LUNCH and ANNUAL MEETING/DÉJEUNER ET RÉUNION ANNVELLE (in Dalton Dining Room) (Presider, Afternoon: *Hardy Grant*)
2:00	*Katherine L. Hill* Hamilton and Bolzano on the Foundations of the Real Numbers
2:30	*Israel Kleiner* Aspects of the Evolution of Commutative Algebra
3:00	*J. J. Tattersall* John Colson's Promiscuous Scheme
3:30	TEA & COFFEE/THÉ ET CAFÉ
4:00	*Liliane Beaulieu* Money for French Mathematics
4:30	*Sylvia M. Svitak* An Historical Approach to the Mathematical Study of Modern Factor Analysis
5:00	*Ajit Kumar Ray* History of Applied Mathematics – Carl Friedrich Gauss

ABSTRACT/RÉSUMÉS

Special Session on Ethnomathematics

M. P. Closs (University of Ottawa). The Ancient Maya: Mathematics and Mathematicians

This lecture will clarify the distinction between ethnomathematics and mathematics using the ancient Maya as a test case. The terms "ethnomathematics" and "mathematics" are biased unless a non-ethnocentric perspective is achieved. This problem will be addressed by examining the content of Maya mathematics and by the identification of Maya mathematicians as a specialized subgroup of Maya scribes.

S. Kunoff (Long Island University). Some Inheritance Problems in Ancient Hebrew Literature.

Much of ancient mathematics seems to have developed in connection with real physical or philosophical problems that concerned people of the time. This theory will be explored in connection with inheritance problems as discussed in early Hebrew texts. References will be made to the writings of Saadia Gaon and Ibn Ezra. Differences in interpretation between the writings of Hebrew scholars and others will be considered.

Contributed Papers

F. Abeles (Kean College). Herbrand's Theorem and the Beginning of Logic Programming.

In this paper we trace the development of the foundations of logic programming from Jacques Herbrand's 1930 doctoral thesis at the University of Paris. Herbrand's Theorem, a fundamental result in the research sparked by Hilbert's Program, provided the key step in establishing the inconsistency of clausal forms, the analogue in logic programming of WFF's in first order predicate logic.

W. S. Anglin (McGill University). Did Euclid Prove Unique Factorisation?

T.L. Heath, H. Eves, and H.N. Shapiro notwithstanding, the *Elements* does not contain a proof of the uniqueness of the prime factorisation of positive integers. The alleged proof (Proposition IX 14) establishes unique factorisation only for special kinds of integers. The alleged proof rests on a proposition whose proof is faulty, namely, Proposition VII 20. Furthermore, the author of Books VII to IX of the *Elements* himself understood the proof of Proposition IX 14, not as 'essentially' a proof of unique factorisation, but merely as a proof of a special case.

L. Beaulieu (Université du Québec à Montréal and Collège de Rosemont). Money for French Mathematics.

French mathematics in the interwar period is usually described in declinist tones and contrasted with the contemporary brilliance of German mathematics. Nevertheless, American and French philanthropists, as well as French governmental agencies, thought of French mathematics as a worthy investment.

This story is a chapter in the history of American philanthropy as it meshes with the history of French foundations and proto-C.N.R.S. policies and programs. It provides new insights on French mathematics between the wars, as seen from the points of view of French and foreign mathematicians, and those of funding decision-makers.

A comparison between patterns of funding for physics and mathematics as well as a comparative study between the circulation of mathematicians and physicists in France in the interwar period brings to light some of the factors responsible for the persistent "success" of French mathematics at times of economic, political and organizational unrest.

R. H. Eddy (Memorial University of Newfoundland). Some Contributions of C. H. Nagel to plane Euclidean geometry.

In 1836, Christian Heinrich von Nagel published the book *Untersuchungen über die wichtigsten zum Dreiecke gehörenden Kreise* which seems not to be well known but which contains many interesting, and seemingly original, results relating to the geometry of the triangle. In this talk, we discuss some of these results along with some recent extensions.

F. F. Falvo & H. R. Love (University of Prince Edward Island). Pythagoras: MYSTICISM AND MATHEMATICS – The two can live in the same mind!

This FOUNDER of mathematics was a religious leader with a strong mystic tendency. He saw in numbers the essence of things. He more or less attributed to numbers what later on came to be called "mystical power". He considered the number ten to be SACRED. He believed in the "harmony of the spheres".

It is not that he started as a mystic, outgrew it, and became a mathematician. Mathematics and mysticism cohabited in his mind.

One would expect his mysticism to contaminate his science. Not so. While remaining a mystic, he founded large areas of mathematics, **and** proceeded to discover a very impressive body of geometry.

How did he do it? He started with simple presuppositions–about a dot and a line–, proceeding through DEDUCTION, arrived at a theorem, used it as a PLATFORM to discover another, and so on. As much as a third of Euclidean geometry was discovered by Pythagora, it seems: five(?) of the 13 books.

We are told science progresses, at least partially, by detecting errors in held positions at any given time; and that, consequently, much of what is considered scientific truth today will in 25 years be considered erroneous, and will therefore be discarded. But much of what Pythagoras discovered 2500 years ago is still being taught in our schools today. And, it is perhaps the most solid part of our science.

C. Fraser (University of Toronto). The Origins of Euler's Variational Calculus.

Euler's major contribution to the calculus of variations was his classic treatise *Methodus inveniendi curvas lineas* of 1744, a work that was preceded by several memoirs published in the 1730s in the proceedings of the St. Petersburg Academy of Sciences. Commenting on the significance of these researches historian Herman Goldstine has written: "[Euler] change[d] the subject from the discussion of essentially special cases to a discussion of very general classes of problems ... he took the fairly special methods of James and John Bernoulli and transformed these into a whole new brand of mathematics."

The paper presents an overview of historical work on the calculus of variations and traces the evolution of Euler's original ideas in the subject. Special attention is devoted to an examination of Jakob Bernoulli's earlier pioneering work and its relation to Euler's theory. The relevant importance of Johann Bernoulli and Brook Taylor in the background to Euler's researches is also considered.

H. Grant (York University). The certainty of Mathematics: A Minority View.

For many centuries the unique certainty of mathematics was ascribed to the unique clarity with which our minds perceive objectively subsisting mathematical objects and relations; the classic statements was that of Descartes. A minority tradition, spanning the age of Descartes, located the certainty of mathematics in quite another direction. Four thinkers, of whom at least three (arguably, all four) were of the first rank, espoused this alternative stance. The case is not without its ironies: their view of mathematics was on the face of it quite sophisticated, and had a strikingly modern ring, yet none of the four was a creative mathematician, and none did real justice to the subleties of even contemporary mathematics.

K. L. Hill (University of Toronto). Hamilton and Bolzano on the Foundations of the Real Numbers.

By 1835 Sir William Rowan Hamilton and Bernard Bolzano had separately produced the two earliest modern attempts to found the real numbers on a rigorous basis. Although both efforts were flawed, nevertheless they are of historical and philosophical interest. This paper will explore the difference between what concepts the two men perceived to be internal versus external to mathematics, and how these perceptions seem to have affected the content of their presentation of the real numbers. Hamilton was motivated by his idealist philosophical views (which are usually assumed to be external to mathematics) to formulate his number system in terms of 'moments' of time. His beliefs also compelled him to seek *true* foundations and not a mere system of rules or a language. Bolzano, however, did not accept time as being a concept internal to mathematics. He stated: "No one will deny that the concepts of time and motion are just as foreign to general mathematics as the concept of space." The divergence of opinion is an instructive example of how even when considering the same time period and the same problem the line between what can be viewed as internal and what can be viewed as external to mathematics is unclear.

I. Kleiner (York University). Aspects of the Evolution of Commutative Algebra.

I will describe the origins and early evolution of some basic notions of commutative algebra, such as commutative ring, ideal, and unique factorization.

E. Kreyszig (Carleton University, Ottawa). Basic Ideas of Functional Analysis: Motivations, Developments, Interrelations

Functional analysis is one of the great mathematical creations of our century that had decisive influence on the transformation of mathematics from its nineteenth century traditions to its present form. The field is usually considered to have begun in 1887 with the publication of five notes on functionals by Volterra.

In this talk we trace the very heterogeneous classical roots of the ideas that eventually took concrete shape in the creations of the great masters, Volterra, Lebesgue, Fréchet, Hilbert, F. Riesz, Banach, Hahn, von Neumann and their schools. This includes

i. motivations of abstract concepts and theories by concrete classical settings and problems that reach back far before (in works by Weierstrass, C. Neumann, Cantor, Dedekind, etc.),

ii. emphasis on intrinsic necessities (as opposed to accidental progress) propelling most of the relevant major developments,

iii. interrelation between the conceptual development of functions (and operators) and spaces of their domains and ranges,

iv. interrelated growth of ideas in functional analysis and point set topology, a mutual give-and-take process until about 1930,

v. effects of classical physics and quantum mechanics on the development,

vi. ideas with roots in the second period but maturing only after 1933.

A.K. Ray (Fundamental Research Institute). History of Applied Mathematics - Carl Friedrich Gauss.

Some of Gauss's discoveries were made while he was a student. Later on, he was appointed Director and professor of Astronomy at Gottingen University, which offices he held till his death. Gauss's lectures were singularly lucid and perfect in form and exhaustive in details that are conspicuously absent from his published works.

The present exposition considers the characteristics of the eighteenth and nineteenth century mathematics that nurtured Gauss and opened the door for his immortality. Furthermore, some of Gauss's discoveries and their applications in modern times are discussed.

A. Shenitzer (York University). Examples of Teaching Mathematical Ideas.

Tell a mathematical story suggested by the following string of names or terms:

i. Reflection, refraction, the brachystochrone problem, the optical- mechanical anology.

ii. The Pythagoreans, Eudoxus, Dedekind.

iii. LaGrange, Gauss, Abel, Galois; Gauss, Kummer, Dirichlet, Dedekind, Kronecker, Weber, Hilbert, Hemsch, Steinitz.

iv. D'Alembert, Euler, Daniel Bernoulli, Fourier, Sturm, Liouville, ...

v. Hippocrates, Archimedes, Cavalieri, Fermat, Newton, Leibniz, Cauchy, Riemann, Lebesque.

vi. The Greeks, Desargues, Newton, Poncelet, Laguerre, Steiner, von Staudt, Cayley, Klein.

S. M. Svitak (Queensborough Community College). An Historical Approach to the Mathematical Study of Modern Factor Analysis.

Factor Analysis as a method of investigation has its origins in the correlational studies of Francis Galton and Karl Pearson. The modern theory can be said to have begun with the work of L. L. Thurstone starting in the early 1930s. The purpose of this paper is to provide an historical introduction to modern factor analysis through a description of the "box problem", a tutorial created in 1940 by Thurstone to show that factor analysis recovers an underlying number of parameters (factors) in a set of variables and to demonstrate what the analysis reveals about them and their relationships. A number of other tutorial examples have been reported in the literature as attempts to study and expose the logic of analysis by factoring, to elucidate the meaning of the factors obtained and to convince skeptics that factor analysis is a viable method of scientific investigation, but the classic "box problem" remains one of the best artificial experiments for presenting and studying heuristically the mathematical aspects of factor analysis.

J. J. Tattersall (Providence College). John Colson's Promiscuous Scheme.

John Colson, the fifth Lucasian Professor of Mathematics at Cambridge University, was known neither for his mathematical research nor his teaching, but for his linguistic ability. His main occupation was working as a translator for the booksellers. Some of his work was noteworthy for he made the first English translation of Newton's *Method of Fluxions* and was instrumental in publishing *The elements of algebra* by Nicholas Saunderson, the blind mathematician. His translation of Maria Agnesi's *Institutioni analitische ad uso della gioventu italiana* was a significant milestone in the recognition of the mathematical achievements of women. He is credited with but one original mathematical result, which he referred to as a "promiscuous scheme" to introduce positive and negative figures in the same expression. The scheme has been rediscovered on several occasions most notably by Cauchy in 1840 in connection with the construction of logarithmic tables. In this paper, we discuss some possible origins for his 2-way numbers and the advantages and disadvantages of calculating with them.