Annual Meeting/Réunion Annuelle

The Canadian Society for History and Philosophy of Mathematics/ Société canadienne d'histoire et de philosophie des mathématiques

Laval University, May 25-27, 2001

FRIDAY, MAY 25, 2001

General Session I/Session Générale I
Adrien-Pouliot (A-P) room 2501

Chair: Amy Ackerberg-Hastings

9:00	Jacques Lefebvre, Université du Québec, Montréal Mathematical-like Deduction, Political Science, and Law in Hobbes's Work
9:30	Madeline Muntersbjorn, University of Toledo Algebraic Representation and Rectification in the 17th Century
10:00	Coffee Break/café

Chair: Robert Thomas

10:30	Roger Godard, Royal Military College Reichenbach, the Diagrammatic Approach in the Theory of Probability and Logic
11:00	Alexei Volkov, Concordia University, Montreal On the Contents and History of One Vietnamese Mathematical Treatise
11:30	Duncan J. Melville, St. Lawrence University The Earliest Word Problems

12:00	SCHPM/CSHPM Executive Council Meeting

General Session II/Session Générale II
A-P 2501

Chair: J. J. Tattersall

2:00	Steven Gimbel, Gettysburg College Poincaré, the Language of Mathematics, and the Intuitionist/Formalist Debate
2:30	Gregory H. Moore, McMaster University Paper Tigers and Cholera Bacilli: A 19th-Century Italian Debate on Infinitesimals
3:00	Michael Kinyon, Indiana University—South Bend The Early History of Quasigroup/Loop Theory
3:30	Coffee Break/café

Chair: Hardy Grant

4:00	Don Fallis, University of Arizona Clarifying the Epistemic Objectives of Mathematicians
4:30	Wayne Myrvold, University of Western Ontario Two Models of Computation on the Reals

SATURDAY, MAY 26

Special Session on French Mathematics I/Session Spéciale I
A-P 2501

Chair: Roger Godard

10:00	J. J. Tattersall, Providence College Mathematics and Nyctaginaceous Shrubs
10:30	Thomas Drucker, Pennsylvania State University—Harrisburg Descartes to Port-Royal: French Logic in the Seventeenth Century
11:00	Louis Charbonneau, Université du Québec, Montréal Toward an Unified Algebra in the Middle of the 17th Century
12:00	SCHPM/CSHPM Annual General Meeting

General Session III/Session Générale III
A-P 2501

Chair: Robert E. Bradley

2:00	Patricia R. Allaire, Queensborough Community College, CUNY; and Robert E. Bradley, Adelphi University D. F. Gregory's Quest for an Algebraic Foundation of the Calculus
× 2:30	Francine F. Abeles, Kean University Warren Weaver on the C. L. Dodgson Nachlass
3:00	Patti W. Hunter, Westmont College Statistics in the States Comes of Age: A Case Study in U. S. Influence Abroad
3:30	Coffee Break/café

Chair: Patricia R. Allaire

4:00	Erwin Kreyszig, Carleton University * Surfaces and Manifolds: Their General Impact
4:30	Peter Griffiths, Independent Scholar John Machin in 1706 Was the First to Recognise That the Analogy Between the Product of Complex Numbers and the Sum of Arcotangents Could Enable Pi to be Valued to a High Number of Decimal Places
5:30-7:00	Reception, 2001 Congress of the Social Sciences and Humanities/Congrés des sciences sociales et humaines 2001 and Université Laval, *PEPS*

* on the booklet

SUNDAY, MAY 27

Special Session on French Mathematics II/Session Spéciale II
A-P 2501

Chair: Louis Charbonneau

9:00 Jean Dhombres, Ecolé des Hautes Études en Sciences Sociales, Paris
The *Applied Mathematics* Origins of Lesbesgue Integration Theory and Why It Was Read as *Pure Mathematics* During the First Years of the 20th Century

10:00 Coffee Break/café

10:30 Amy E. Shell, United States Military Academy
The Olivier String Models at the United States Military Academy

11:00 Robert E. Bradley, Adelphi University
The Origins of Linear Operator Theory in the Work of Francois-Joseph Servois

11:30 Ed Cohen, University of Ottawa
The French Revolutionary Calendar

12:00 Lunch Break

General Session IV/Session Générale IV
A-P 2501

1:15 General meeting 2:00

Chair: Thomas Drucker

2:00 Steven N. Shore, Indiana University—South Bend
Macrocosmos/Microcosmos: Celestial Mechanics and Quantum Theory

× 2:30 Glen Van Brummelen, Bennington College
The Birth of an Independent Trigonometry: Revolution and Conflict in Tenth-Century Islamic Spherical Astronomy

3:00 Craig Fraser, University of Toronto
William Rowan Hamilton's Conception of Mechanics: A Preliminary Report

× ~~3:30 Rebecca Adams, Vanguard University~~
~~Early Metrization Theorems~~

Ad Bradley
'Obscure though influential'

The Canadian Society for History and Philosophy of Mathematics — May 25-27, 2001
Société canadienne d'histoire et de philosophie des mathématiques — 25-27 mai 2001

ABSTRACTS
Special Session (French Mathematics)

Robert E. Bradley
Adelphi University
The origins of linear operator theory in the work of François-Joseph Servois

In the development of a rigorous foundation for calculus, François-Joseph Servois (1768-1847) occupied a crucial position, lying both chronologically and conceptually between Lagrange and Cauchy. In addition, his work was influential on the mid-19th century algebraists working in Great Britain. Furthermore, as the first mathematician to codify and exploit the algebraic properties of analytic operators, he may be considered the originator of the modern trend for proving analytic results via algebraic means. In this presentation, we survey Servois' career and his mathematical accomplishments, particularly his 1814 paper on differential operators in the *Annales des mathématiques*.

Louis Charbonneau
Université du Québec, Montréal
Toward an unified algebra in the middle of the 17th century

The publication of *La géométrie* by Descartes in 1637 constitutes a turning point in the history of algebra. This book displaced Viète's new algebra as a way of doing algebra. Nevertheless, Viète's work remained an important influence throughout the century. In his *Dictionnaire mathématique ou idée generale des mathématiques* (1691), Ozanam still distinguished between two kinds of algebra: *algèbre vulgaire ou nombreuse* and *algèbre specieuse ou nouvelle*.

In this paper, we shall see how, in books which, at first glance, look like French translations of Viète's book, *algèbre specieuse* was transformed by the introduction of *algèbre vulgaire*. We will briefly study the books of Noel Durret and Pierre Herigone. Analysis will focus on James Hume's book entitled *Algèbre de Viète, d'une methode nouvelle, claire, et facile. Par laquelle toute l'obscurité de l'nventeur est ostée, & ses termes pour la pluspart inusites, changez es termes ordinaires des artists* (1636). It will also be shown how *algèbre vulgaire* was itself transformed by this rewriting of Viète's algebra.

Ed Cohen
University of Ottawa
The French Revolutionary Calendar

The revolutionary calendar devised by the Republicans after they ousted the King of France in the 1790s lasted 13 years. It was created by mathematicians, astronomers, and one poet. The period was so hectic that Charles Dickens, who lived shortly thereafter, wrote his epic *A Tale of Two Cities* novel about this; it began with "It was the best of times; it was the worst of times..." The era began on 14 July 1789 with the seizing of the Bastille in Paris. The calendar was intentionally anti-Christian and anti-Saints. Napoleon restored the Gregorian calendar in 1806.

Jean Dhombres
Ecole des Hautes Etudes en Sciences Sociales, Paris
The "applied mathematics" origins of Lebesgue integration theory and why it was read as "pure mathematics" during the first years of the 20th century

The Lebesgue integral has been the key element for the launching of a new domain in mathematics, functional analysis, for which there exist very good historical descriptions. This domain has been one of the major links between mathematics and physics during the 20th century, and certainly the main source of change for numerical mathematics. However, the Lebesgue integral is generally presented as a typical move towards abstraction, and even towards pathologies. By reconsidering documents about the invention of this integral, and particularly Lebesgue's letters to various mathematicians during the first years of the last century, one may discover another influence in the thoughts of the inventor, linked to approximation theory and Weierstrass. This may also offer an unusual view of the mathematics in Paris around 1900, at least quite different from the programme Hilbert described in August 1900.

Thomas Drucker
Pennsylvania State University--Harrisburg
Descartes to Port-Royal: French Logic in the Seventeenth Century

Descartes's antipathy to the logic he inherited from Aristotle and mediaeval logicians led him to downplay the importance of logic in mathematics and the sciences. It was left to his successors to find a place for his view of logic in the course of their scientific investigations. This talk traces some of the consequences of Descartes's attitude in the work of Pascal and his contemporaries.

Amy E. Shell
United States Military Academy, West Point
The Olivier String Models at the United States Military Academy

Sylvanus Thayer, the "Father of the Military Academy," after a visit to France and England, revised the educational structure of West Point on the model of the Ecole Polytechnique. One faculty member that he hired to assist in this modernization was Claude Crozet who graduated from the Ecole Polytechnique in the same class as Augustin Cauchy, and was a student a Gaspard Monge. When Crozet came to West Point, he introduced the teaching of Descriptive Geometry in 1816. Descriptive Geometry became a staple of the USMA curriculum until well into the twentieth century.

The department owns a set of 23 string models that were constructed under the supervision of Theodore Olivier (1793-1853). The original set is at the Conservatoire National des Arts et Metieres in Paris where Olivier taught. These models are built on wooden boxes as bases, have metal supports, and consist of strings suspended from movable arms and arranged to form a variety of geometrical figures. The strings are held in place by lead weights that are concealed by the bases. The models illustrate such things as the intersection of two half cones, the intersection of a plane, hyperbolic paraboloid and a hyperboloid of one sheet, and the intersection of two half cylinders.

This talk will give a history of the influence of French mathematics and mathematicians on West Point, as well as a description of the Olivier models.

J. J. Tattersall
Providence College
Mathematics and Nyctaginaceous Shrubs

Louis Antoine de Bougainville (1729-1811) was a mathematician and an explorer. He was a student of D'Alembert and wrote an impressive sequel to L'Hospital's *Analyse des Infiniment Petits*. He was stationed in Canada for a time and was present at the Battle of Quebec. We discuss some of the contents of his book and recount several of his adventures.

General Session

Francine F. Abeles
Kean University
Warren Weaver On the C.L. Dodgson Nachlass

The Morris L. Parrish Collection in the Firestone Library, Princeton University includes the mathematical Nachlass of C.L. Dodgson (Lewis Carroll). Warren Weaver (1894-1978), the noted expositor of modern physics, described and commented on this material, 1787 pages, in a long typescript. In this paper I will describe the contents of the typescript, and discuss important pieces of Dodgson's work that deserve further study. I also will provide biographical background about Weaver and the circumstances that led him to write the typescript.

Rebecca Adams
Vanguard University
Early Metrization Theorems

This is a comparative analysis of mathematical styles utilized in the early period of general topology. The focus is on the work of Aleksandrov and Uryson (1923), "Conditions necessaire & suffisante pour qu'une classe (L) soit une classe (D)," and Aline H. Frink (1937), "Distance Functions and the Metrization Problem." The historical mathematical environments represented by these two works will be discussed and is personalized by accounts from a lengthy correspondence between Aline Frink and the speaker. Aline H. Frink died on March 14, 2000.

Patricia R. Allaire (presenter) and Robert E. Bradley
Queensborough Community College, CUNY, and Adelphi University
D. F. Gregory's Quest for an Algebraic Foundation of the Calculus

Cambridge mathematician Duncan Farquharson Gregory (1813-1844) authored *Examples of the Processes of the Differential and Integral Calculus*. This volume, a complete revision of George Peacock's 1820 similarly titled work, was written to accompany the standard calculus texts in use at Cambridge. Unique to Gregory's edition is his intensive use of the techniques of symbolical algebra, particularly the method of separation of symbols, and what he considers to be a rigorous justification of the method, along with its historical background.

Don Fallis
University of Arizona
Clarifying the Epistemic Objectives of Mathematicians

The goals that we have determine the sorts of actions that we should take to achieve those goals. This applies to our epistemic goals as well as to our pragmatic goals. Thus, it should be possible to make some inferences about the epistemic objectives of mathematicians by looking at the epistemic practices that they engage in. In this talk, I discuss how work on epistemic value theory (see, e.g., Levi 1967 and Goldman 1999) can be used to clarify the epistemic objectives of mathematicians. For example, mathematicians clearly seek the truth like any other scientists. However, the epistemic practices of mathematicians (e.g., writing down deductive proofs) seem to indicate that they are significantly more averse to epistemic risk.
Alvin Goldman. (1999). *Knowledge in a Social World.* New York: Oxford University Press.
Isaac Levi. (1967). *Gambling With Truth.* Cambridge: MIT Press.

Craig Fraser
University of Toronto
William Rowan Hamilton's Conception of Mechanics: A Preliminary Report

The paper reports on historical work carried out by the author with Michiyo Nakane on the beginnings of Hamilton-Jacobi theory. Working in relative isolation in Ireland, Hamilton presented his account of mechanics in two long essays published in the *Philosophical Transactions* in 1834 and 1835. Hamilton believed that he was creating a new branch of mathematical science, a "calculus of principal functions," and the 1834-1835 essays provided only an outline of the subject. Although many of Hamilton's innovations were accepted by other researchers and proved highly fruitful, other aspects of his theory were particular to his own investigation. The paper provides a comparative study of Hamilton's original approach in relation to the subsequent elaboration of classical Hamilton-Jacobi theory.

Steven Gimbel
Gettysburg College
Poincaré, the Language of Mathematics, and the Intuitionist/Formalist Debate

Jules Henri Poincaré was simultaneously claimed as a forefather for both sides of the intuitionist/formalist debate. He explicitly opposed the analytic axiomatic approach to mathematics which was beginning to blossom at the end of the 19th century, but the conventional approach to geometry that emerges from his writings on the conceptual foundations of mathematics are generally cited as a great influence on the acceptance of the axiomatic approach. This discussion considers the work that Poincaré does in order to separate his view from that of Immanuel Kant, arguments that are mistakenly taken to be directed against empiricism. In pointing out what he sees as Kant's conceptual misunderstandings, Poincaré is led to view geometry as a branch of group theory and oppose considering the general treatment of manifolds by Bernhard Riemann to be geometry at all. The rationale for this restrictive definition of geometry leads to the conclusion that Poincaré is to be labeled as neither a proto-intuitionist nor a proto-formalist, but rather posits a deep mathematical linguistic faculty in the human mind of the sort Noam Chomsky would champion over half a century later.

Roger Godard
Royal Military College
Reichenbach, the diagrammatic approach in the theory of probability and logic

In *The Theory of Probability, an Inquiry into the Logical and Mathematical Foundations of the Calculus of Probability*, first published in German in 1933-1934, H. Reichenbach was one of the first to illustrate several theorems with diagrams. Indeed, this approach is closely linked to the diagrammatic approach in Logic, which was already more advanced at the time. It seems that Friedrich Albert Lange was the precursor in the diagrammatic approach for the Theory of probability, and his work was probably known to Hans Reichenbach. However, Peirce did considerably more for the diagrammatic approach in Logic and the Graph Theory, but he did not use a diagrammatic approach in the Theory of probability.
We have tried to establish a link for the evolution of ideas in the history of the diagrammatic representation in Logic, the Theory of probability, and Logic and the Graph Theory. In conclusion, and in order to illustrate the limitations of geometrical approaches, we discuss in final, Leibniz for his thought:
«Sans doute, il ne faut pas raisonner sur la figure, et remplacer la déduction par la simple inspection; il est bon d'apprendre à raisonner sans aucune figure ... »

Peter L. Griffiths
Independent Scholar
John Machin in 1706 was the first to recognise that the analogy between the Product of Complex Numbers and the Sum of Arcotangents could enable π to be valued to a High Number of Decimal Places.

The main historical techniques for an accurate computation of π include: 1) Archimedes's Half Angle Formula and its reversion the Double Angle Formula. 2) James Gregory's Arctan series discovered in 1671. 3) John Machin's recognition in 1706 of the similarity between the Double Angle formula and the product of two complex numbers.

There will be a reference to Abraham de Moivre's extension in 1708 of John Machin's double angle formula, and also to Francis Maseres's comments in 1796 on Machin's discovery. Abraham de Moivre was born in France in 1667, but lived most of his life in London, where he died in in 1754. Francis Maseres was born in London in 1754 and was descended from a French Huguenot family. As well as being a mathematician, he was called to the Bar from the Inner Temple in 1758 and from 1766-1769 he was Attorney-General of Quebec. On returning to England he represented the interests of the Protestant settlers of Quebec.

Patti W. Hunter
Westmont College
Statistics in the States Comes of Age: A Case Study in U.S. Influence Abroad

«The status of statistics in the rapidly developing countries is not too different from what my generation experienced in the nineteen twenties.» So wrote Gertrude Cox in 1966, upon her return from a year as visiting professor and consultant at the University of Cairo, Egypt. Cox had received her education in statistics in the 1920s and '30s, during the formative years of the discipline's professional community in the United States. By the late 1940s, the community had journals, professional organizations, and departments in a few research universities to support its development.

Some encouragement and assistance in building this infrastructure had come to statisticians in the U.S. from scientists abroad. Statisticians came as visiting lecturers and consultants, American students went abroad for training, and a number of scholars who would play important roles in the statistics community came to the United States from Europe during the upheaval of World War II.

Gertrude Cox's experiences in Egypt in the early 1960s provide evidence that by this time, the statistics community in the United States had matured to such an extent that its members had begun to influence the development of the discipline on an international level. Americans, Cox among them, were providing advice and training to emerging statistics communities abroad, particularly in developing nations.

In this talk I will describe Cox's contributions in Egypt, highlighting their implications for the history of statistics in the United States.

Michael Kinyon
Indiana University South Bend
The Early History of Quasigroup/Loop Theory

In writing the history of abstract algebra, it is not only of interest to examine the major trends, such as group theory, ring theory, etc., but also some of the specialities that are a bit out of the mainstream. Quasigroup and loop theory, which traces its origins to 1929, is such a field. A recent historical survey by Pflugfelder gives an overview of developments in the field from its beginnings to the present day. In this talk, I will start by quickly summarizing the early work of Suschkewich, Bol, and Moufang, and then I will offer a "close reading" of a series of papers by American mathematicians (Hausmann and Ore, Murdoch, Garrison) leading up to the seminal papers of Albert in the early 1940's. Besides describing the results, I hope to set some context, including the motivations these writers had in studying "nonassociative groups". I will also indicate which among their ideas had staying power and which fell by the wayside, and what the various reasons were.

Erwin Kreyszig
Carleton University
Surfaces and Manifolds: Their General Impact

The theory and application of surfaces had considerable impact as well as a unifying effect on several branches of mathematics. It made use of accomplishments of the theory of curves that had developed earlier along with the calculus. In this paper it is shown how various isolated results were amalgamated by Gauss in his famous *Disquisitiones circa superficies curvas*. In less than fifty pages, Gauss was able to present the foundation of classical differential geometry and its applications. We then discuss the historical aspects of the ideas that led from surface theory to the creation of manifolds by Riemann, their application in physics, and their development beyond analysis, in topological work by Poincaré and others.

Jacques Lefebvre
Université du Québec, Montréal
Mathematical-like Deduction, Political Science, and Law in Hobbes's Work

We shall start by recalling the preeminence, in Hobbes's epistemology, of deductive knowledge, i.e. reasoning from the causes (hopefully, mechanistic causes) to the consequences or effects. Mathematics, indeed geometry, was for him the utmost model for that. But Hobbes (1588-1679) pretended that one could proceed in the same manner when establishing the theoretical foundations of political science and law. In fact he did so. We will briefly put forward his general claim. We shall then examine more precisely the structure and pattern of his deduction of the fundamental laws of civil society (mainly in "De Cive" and in "Leviathan"). This will show many similarities with mathematical deductive arguments and writings, and ... some differences, of course.

Duncan J. Melville
St. Lawrence University
The Earliest Word Problems

In the middle of the third millennium, the city of Shuruppak was an important and flourishing urban centre, with a well-developed administrative structure. Among the administrative documents recovered from this period are several mathematical school-texts, including the world's earliest word problems. We will discuss what we can learn about the mathematics of the time from these few tablets.

Gregory H. Moore (OR 'Magnitude, Geometry, + Infinitesimals')
McMaster University
Paper Tigers and Cholera Bacilli: A 19th-Century Italian Debate on Infinitesimals

This talk discusses some of the history surrounding infinite and infinitesimal magnitudes and numbers, as well as various answers to the question "What is a magnitude?". We focus on the late 19th century, when infinitesimals were revived in Germany by du Bois-Reymond, Stolz, and Thomae. In the 1890s the Italians Bettazzi, Veronese, and Levi-Civita developed infinitesimals further in the context of "magnitudes" and of projective geometry. Cantor was vehemently opposed, arguing that infinitesimals are contradictory, and was supported in this by Peano and then Russell. Hilbert (1899) and Hahn (1907) showed the usefulness of non-Archimedean ordered fields. By 1961, when Robinson invented non-standard analysis, infinitesimals were well accepted in algebra but not in analysis, since no one knew how to use them to prove theorems in calculus in a rigorous way.

Madeline M. Muntersbjorn
University of Toledo, Ohio
Algebraic Representation and Rectification in the 17th Century

The development of analytic geometry at the beginning of the 17th Century and of the calculus towards the end is no mere coincidence. Yet detailed accounts of the causal connection between increased reliance on algebraic notation and the articulation of more general algorithms are scarce—perhaps because the advantages of algebraic notation are so obvious in retrospect that the connection does not provoke scrutiny. In the mid-17th Century the problem of finding straight lines commensurate with given curves became a focus of mathematical attention. The solutions of Fermat, van Heuraet, et al, show how the rectification of particular curves depends on the solution of specific tangent and quadrature problems. Contrasting their methods illustrates the capacity of algebraic symbolism to display unifying relationships between these kinds of problems. Thus, the study of rectification methods from the 1650s exhibits, in part, the role algebraic representation played in the development of the calculus. This study also reminds us that, in the history of mathematics, what appears obvious in retrospect may have been difficult, if not impossible, to see before the cultivation of new methods of representation.

Wayne C. Myrvold
University of Western Ontario
Two Models of Computation on the Reals

In this paper, two approaches to modelling computation over the real numbers are compared, and the relative merits of each weighed as models of scientific computation. One is the model advocated by Blum, Shub, and Smale (1989, 1998), Traub (1999), and Werschulz (Traub and Werschulz 1998), variously known as the "continuous model" or the "real number model"; on this model, real numbers are treated as simple objects, and certain operations on the reals are taken as primitive. The other approach to be considered has its roots in more traditional recursion theory; on this approach, real numbers are approximated by elements of a countable set; operations on this countable set are taken as primitive. Workers along these lines include Pour-El and Richards (1989) and Weihrauch (2000). It is sometimes called the "discrete model," or the "Turing Machine model." The basic notions of computability on the reals are Grzegorczyk computability (Grzegorczyk 1957) and generalizations thereof.

It will be argued that some of the claims made regarding the advantages of the continuous model by its advocates (Blum, Cucker, Shub and Smale 1996; Traub 1999; Traub and Werschulz 1998) stem from an insufficient appreciation of the power of the more traditional "discrete" approach. This will be illustrated by applications to classical and quantum mechanics. Examples of computational problems that count as solvable and unsolvable on this approach will be given.

Blum, Lenore, Mike Shub, and Steve Smale (1989). "On a Theory of Computation and Complexity over the Real Numbers: NP-Completeness, Recursive Functions, and Universal Machines." *Bulletin (New Series) of the American Mathematical Society* **21**, 1-46.

Blum, L., F. Cucker, M. Shub, and S. Smale (1996). "Complexity and real computation: a manifesto." *International Journal of Bifurcation and Chaos* **6**, 3-26.

----- (1998). *Complexity and Real Computation.* New York: Springer-Verlag.

Grzegorczyk, A. (1957). "On the Definitions of Computable Real Continuous Functions." *Fundamenta Mathematicae* **44**, 61-71.

Myrvold, Wayne C. (1995). "Computability in Quantum Mechanics," in Werner DePauli-Schimanovich, Eckehart KM-vhler, and Friedrich Stadler, eds., *The Foundational Debate: Complexity and Constructivity in Mathematics and Physics.* Dordrecht: Kluwer Academic Publishers, 33-46.

----- (1997). "The Decision Problem for Entanglement," in R. S. Cohen, M. Horne, and J. Stachel, eds., *Potentiality, Entanglement and Passion-at-a-Distance: Quantum Mechanical Studies for Abner Shimony.* Dordrecht: Kluwer Academic Publishers, 177-190.

Pour-El, Marian Boykan, and Ian Richards (1989). *Computability in Analysis and Physics.* New York: Springer-Verlag.

Traub, Joseph F. (1999). "A Continuous Model of Computation." *Physics Today* **52** (May), 39-43.

Traub, J.F., and A.G. Werschulz (1998). *Complexity and Information.* Cambridge: Cambridge University Press.

Weihrauch, Klaus (2000). *Computable Analysis.* New York: Springer-Verlag.

Steven N. Shore
Indiana University South Bend
Macrocosmos/Microcosmos: Celestial Mechanics and Quantum Theory.

The Bohr atom was a solar system in miniature. Despite many deep foundational questions related to the origin of quantized motion, rapid progress was made in its mathematical development and its apparently successful application to spectral line series. This was especially true in the United States, where a tradition of celestial mechanics flourished at the turn of the 20th century following the work of Hill, Gibbs, Newcomb, Moulton, and Brown. This talk will focus on a largely neglected link between classical problems of perturbation theory, three body and N-body orbital trajectories, transfer orbits, and the old quantum theory, culminating in the National Research Council report by E. P. Adams and Sommerfeld's "Atomic Structure and Spectral Lines". I will discuss some reasons why it was particularly easy for this community of applied mathematicians, astronomers, and mathematical physicists to make the switch to old quantum theory so easily and why further progress toward quantum mechanics by the same cohort was, comparatively, so slow.

Glen Van Brummelen
Bennington College
The Birth of an Independent Trigonometry: Revolution and Conflict in Tenth-Century Islamic Spherical Astronomy

The adoption of Ptolemaic methods by Islamic astronomers in the ninth century AD included the astronomer's toolbox of spherical trigonometry. Considered foundational to astronomy and, in fact, a part of it, trigonometry began with the two theorems known jointly as Menelaus' Theorem, used to great effect by Ptolemy in the Almagest. Three late tenth-century scientists (Abu 'l-Wafa', al-Khujandi, and Abu Nasr Mansur) re-invented the science with the discovery of several new results, each aimed at replacing Menelaus' Theorem. Aside from a bitter priority dispute, this provided the impetus for the beginning of the establishment of trigonometry as a discipline independent of astronomy. Our window to this story will be a short work on rising times by Abu Sahl al-Kuhi, a pure geometer not known for astronomical work, who nevertheless took a stand in favour of the old methods.

Alexei Volkov
Concordia University, Montreal
On the contents and history of one Vietnamese mathematical treatise

In 1998 the author discovered in Hanoi two manuscript copies of the unpublished mathematical treatise "Great compendium of mathematical methods" (Toan phap dai thanh) supposedly written by the Vietnamese scholar Luong The Vinh (1441-?). My analysis shows that the treatise does not contain any evidence supporting the hypothesis of Luong The Vinh's authorship. The title of the book and its attribution to Luong may have been due to later editors or copyists. However, it appears that the book was written on the basis of Chinese mathematical treatises prior to the late 15th century. In my paper I will discuss several mathematical problems found in the Vietnamese treatise and their Chinese prototypes.