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

FIFTH ANNUAL CONFERENCE (1978) - LONDON, ONTARIO JUNE 1&2

PROGRAMME

Thursday, June 1

1:30 pm — INVITED SPEAKER — Social Sciences Center, Room 3026

The Canadian Society for History and Philosophy of Mathematics is pleased to have Professor THOMAS W. HAWKINS of the Department of Mathematics, Boston University as this year's invited speaker. He will be introduced by Dr. J.L. Berggren, President of the CSHPM. Professor Hawkins will speak on

Descartes and the Mathematical Revolution of the 17th Century

3:30 pm — CONTRIBUTED PAPERS — Social Sciences Center, Room 3026

Chairperson: Philip C. Enros, Dept. of History, Univ. of New Brunswick

Charles V. Jones, IHPST, Univ. of Toronto
The Number Presuppositions Underlying Euclid's Elements

J.L. Berggren, Dept. of Math., Simon Fraser Univ.
Abu Sahl al-Kuhi's Theorems on Centres of Gravity

Michael Scott, Univ. of Winnipeg
Geometry in the Ninth-Century Quadrivium

(Short Break)

James Van Evra, Dept. of Phil., Univ. of Waterloo
The Origins of Modern Logic in the Nineteenth Century

Louis Charbonneau, Dept. de Math., Univ. du Québec à Montréal
Une Pré-histoire de la programmation linéaire: les équations litterales depuis Newton jusqu'au debut du XIXe siècle

8:00 pm — DISCUSSION: A PROJECT FOR THE CSHPM — Soc. Sci. Center, Room 3108

Chairpersons: M.P. Closs, V. Linis, Dept. of Math., Univ. of Ottawa

The Society will be asked to support a project on the historical development of mathematics in Canada. This will consist of a monograph project designed to solicit and publish material on the History of Mathematics in Canada. It will also be proposed that a symposium on this theme be held in conjunction with the annual meeting in 1980. At this informal session, the nature and duration of the project will be discussed. Some organizing strategies will also be considered. The opinions and comments of the participants will be greatly appreciated.

Friday, June 2

9:00 am TEACHING THE HISTORY OF MATHEMATICS Social Sciences Center, Room 3108

Chairman: J.L. Berggren, Dept. of Math., Simon Fraser Univ.

Victor Byers, Dept. of Math., Concordia Univ.
Why Study History?

J. Hardy Grant, Dept. of Math., York Univ.
Humanities 146: Mathematics, A Human Endeavour

Jacques Lefebvre, Dept. de Math., Univ. du Québec à Montréal
Deux cours d'histoire des mathématiques: description et reflexions

M.A. Malik, Dept. of Math., Concordia Univ.
A Course on History of Mathematics for School Teachers

11:00 am ANNUAL BUSINESS MEETING Social Sciences Center, Room 3108

2:00 pm CONTRIBUTED PAPERS Social Sciences Center, Room 3026

Chairwoman: Evelyn Nelson, Dept. of Math., McMaster Univ.

Haragauri N. Gupta, Dept. of Math., Univ. of Regina
A.L. Cauchy and A. DeMorgan as Authors of Calculus Texts

Philip C. Enros, Dept. of History, Univ. of New Brunswick
Charles Babbage: Barriers to the Professionalization of Mathematics in Early Nineteenth-Century England

William Aspray, Dept. of the Hist. of Sci., Univ. of Wisconsin
Philosophical Attitudes and Mathematical Research in Logic and Geometry

Francine Abeles, Dept. of Math., Kean College
Voting and Ranking Systems: A Carrollian Paradox

* Please take note of the exhibit of books in our field that Springer-Verlag has sent specially for our Conference. Thanks are also due to IBM Ltd. Canada for their contribution of the chart "Men of Modern Mathematics" to each of the participants at this Conference.

FIFTH ANNUAL CONFERENCE (1978)

ABSTRACTS

NOTE: The following are abstracts which were submitted. Abstracts for some papers were not available.

June 1

CONTRIBUTED PAPERS

J.L. BERGGREN "Abu Sahl al-Kuhi's Theorems on Centres of Gravity"

In the latter part of the 10th Century Abu Sahl al-Kuhi wrote a letter in which he stated theorems on the centre of gravity of circular arcs and sectors. In addition he supplied a table giving centres of gravity of three plane and three solid figures. These are the first exact results on centres of gravity know to us from the Islamic period, and in this talk we shall examine these results within their historical context.

MICHAEL SCOTT "Geometry in the Ninth Century Quadrivium"

The "studia geometriae" in the early Middle Ages is a subject largely misunderstood by the historical community. Since the time of Paul Tannery it has become almost axiomatic to discount early medieval texts on geometry as base and almost devoid of any serious interest in theoretical mathematics. Contrary to this wide-spread notion of a "dark age of science" or isolated Latin west there is evidence to suggest that the best of the Hellenistic geometers, Euclidi Elementa, was available to Latin readers long before the celebrated twelfth century translations from the Arabic by Gerard of Cremona and Adelard of Bath. There are, in fact, several classes of geometry textbooks, contained in manuscripts or bound in codices from the early ninth century, that contain numerous, extensive, and accurate Euclidian fragments. The purpose of this paper is to determine the quality of the geometry, that was studied in the "quadrivium" of the Carolingian schools. The question raised is, to what extent the "disciplina geometriae" was actually practiced in the midst of those so-called "dark ages"?

June 1 CONTRIBUTED PAPERS

JAMES VAN EVRA "The Origins of Modern Logic in the 19th Century"

Unlike the history of mathematics in the same period, the history of logic in the 19th century displays little outward coherence. Faced with the problem of dealing with its apparently disparate elements, historians frequently resort to episodic descriptions of the period, in which the works of logicians are considered in near independence.

What is needed, and what I sketch in this paper, is a context in terms of which developments leading from the early 19th century to the early 20th century can be placed. The context, in turn, is based not only on historical developments during the period, but also on recent developments in understanding the dynamics of theory change in science generally.

L. CHARBONNEAU "Une Pre-histoire de la Progammation Lineaire: les Equations Litterales Depuis Newton Jusqu'au Debut du XIX^{e} Siecle"

Dans son court traité La méthode des fluxions, et des suites infinies, Newton décrit une méthode, en partie graphique, de résolution des équations littérales, i.e. des polynômes dont les coéfficients sont eux-même des polynômes d'autres quantités inconnues. Cette méthode, connue sous le nom de parallélogramme de Newton, fût reprise et affinée par Lagrange en 1776. Elle prit alors une forme purement algébrique. Quelques années plus tard, Lacroix et plus encore Fourier présentèrent le double aspect, géométrique et algébrique, de ce procédé dans leurs cours donnés à l'Ecole Polytechnique nouvellement fondée.

Cette méthode de Newton-Lagrange était basée sur l'étude d'un système d'inégalités linéaires. Fourier ayant rencontré de tels systèmes dans un certain nombre de problèmes de physique et d' "arithmétique politique", décida d'étudier en eux-même ces systèmes. Il réussit à pousser fort loin des algorithmes de résolution de problèmes du type min-max. Il généralisa à plus de trois variables la notion de face de polyèdre, d'arête et de points extrémaux. Malheureusement, ses méthodes ne furent guère appréciées à l'époque et elles tombèrent dans l'oubli.

June 2 — TEACHING THE HISTORY OF MATHEMATICS

VICTOR BYERS — "Why Study History?"

What is the main role of history in mathematics education? Mathematics has two aspects: content and form. Very roughly, the content of mathematics consists of its methods and results; mathematical form involves symbolic notation and chains of logical arguments. In describing the understanding of mathematics a distinction can be made between the understanding of mathematical content and that of mathematical form. A mathematics teacher, however, has to teach both as well as appreciate the relationship between the two. Moreover, whereas the content of mathematics has retained its validity through the years and has grown mainly by accretion, the form of mathematics has undergone a number of profound changes. Thus, the relation between mathematical content and form has to be viewed in a historical context. It is claimed that, in fact, it is impossible to understand the nature of mathematics except through its history. A further claim is made that, for the purposes of education, the fundamental reason for studying the history of mathematics is to throw some light on the nature of the discipline -- and that history courses for teachers should be designed with this aim in mind.

J. HARDY GRANT — Humanities 146: Mathematics, A Human Endeavour

Mathematics is one of the most astonishing of all human creations, at once a science and an art, a rigorous intellectual discipline and a boundless field for the play of imagination, a uniquely powerful tool for understanding the physical world and an enduring source of aesthetic satisfaction. This course will attempt to portray mathematics in all of these various aspects, through an historical survey of its major currents from the earliest times to the present day. Some examples of mathematical thinking will be presented, but for the most part the emphasis will be upon the nature of such thinking and its influence in other areas of human thought. We shall find mathematics shaped and stimulated by social forces, scientific needs and philosophical assumptions, and reacting in turn upon almost every branch of culture, from visions of the physical universe to styles in literature and painting to men's conceptions of the nature of truth. Topics include: Number in "primitive" cultures; Babylonian and Egyptian mathematics; Early Greek mathematics; rise of deductive methods; The Pythagoreans and their influence; discovery of incommensurability; Mathematics in the philosophy of Plato; Hellenistic mathematics; Ptolemaic Astronomy; Mathematics in India; in Islamic civilization; in medieval Europe; in Renaissance art and thought; Copernicus and Kepler; Rise of mathematized science; Galileo; Cubic equations (16th century); Early history of the calculus; Non-Euclidean geometry; Cantor and transcendental numbers. Required reading: M. Kline, Mathematics in Western Culture.

JACQUES LEFEBVRE

MAT 6220 Histoire des mathématiques

Notions générales sur l'histoire des mathématiques jusque vers la fin du XVIIe siècle, avex quelques compléments sur les XIXe etXXe siècles. Étude plus approfondie, d'un point de vue historique, de quelques sujets particuliers (e.g. logarithmes, nombres complexes, etc.). Remarques sur la symbolisation et son utilisation dans l'enseignement des mathématiques. Référence(s): Smith, D.E., History of Mathematics, volume 1; General Survey of the History of Elementary Mathematics, volume II; Special Topics of Elementary Mathematics; Krygowska, Z., Le langage des mathématiques dans l'enseignement; Whitehead, A.N., An Introduction to Mathematics; Dienes, Z.P. et Golding, E.W., Les premiers pas en mathématiques, ensembles, nombres et puissances.

MAT 7220 Histoire des mathematiques

Rappel général sur l'histoire des mathématiques. Choix de périodes, de thèmes, de sujets ou d'auteurs. Développement selon une des orientations suivantes: (a) liens avex l'enseignement des mathématiques. Etude d'un ou de plusieurs essais d'intégration de l'histoire des mathématiques à l'enseignement de concepts mathématiques. (b) discussion des problèmes méthodologiques et historiographiques: histoire interne et histoire externe, les mathématiques et les sciences, les mathématiques et la société. (c) point de vue strictement mathématique. References: Boyer, C.B., A History of Mathematics; May, Kenneth O., Bibliography and Research Manual in the History of Mathematics, 1973; Historia Mathematica (1974 -)

June 2

M.A. MALIK

The Description of a Course on History of Mathematics for School Teachers

Mathematics and its relevance. Babylonian and Egyptian mathematics. Euclid; the fifth postulate and the work of Nasiruddin and Saccheri. Algebra of Al-Khowarizmi and subsequent developments; Descartes' coordinate geometry. Volume and Archimedes; calculus before and after Newton and Leibniz; Berkeley's criticism; the concept of limit. Fourier and the beginning of Analysis; real numbers from Zeno to Cantor; functions and the theory of sets.

June 2

CONTRIBUTED PAPERS

PHILIP ENROS

"Charles Babbage: Barriers to the Professionalization of Mathematics in Early Nineteenth Century England"

Using Charles Babbage (1791-1871) as an example, I shall argue that the approach he took in his mathematics, as well as other aspects of his early life, reveal an important facet of the Cambridge Revival Movement; namely, the desire to make mathematics a profession in Britain. I will then discuss the main reasons why this effort failed.

F. ABELES

"Voting and Ranking Systems: A Carrollian Paradox"

C.L. Dodgson (Lewis Carroll) wrote three pamphlets on elections and committees between 1873 and 1876. It is argued that this work shows that he intuitively understood ranking by paired comparisons, Zermelo analysis and the principle of maximum likelihood.

CSHPM Annual Meetings 1978 June 2

H.N. Gupta, University of Regina

De Morgan and Cauchy
as authors

(ABSTRACT)

The Differential and Integral Calculus by Augustus De Morgan (1806-1871) was published in twenty-five parts between July 1836 and June 1842 before their contents were put together and published in the form of a book in 1842, all under the auspices of the Library of Useful Knowledge, London. At the time of its publication it was by far the most extensive work on the subject ever written in the English language. But as a textbook it failed to score. England was not ready for a text which was both comprehensive and conforming to the strictest standard of rigor conceivable at that time. It was soon surpassed by Isaac Todhunter's (1820-1884) 'A treatise on the differential and integral calculus with numberous examples', far less rigorous in comparison with De Morgan. At the time De Morgan wrote, Lacroix's Traite Elementaire du calcul differentiel et integral, 2 volumes, 1797, was greatly in use everywhere. De Morgan found the work lacking in rigor. Lacroix's book was translated in several languages and by 1874 ran through eight editions (J.A. Serret and Charles Hermile brought out the eighth edition with supplementary notes provided by themselves). De Morgan's textbook, however, faded out of circulation and has not seen a second edition since. A reasonably good textbook of Calculus with a variety of interesting examples from various disciplines has a better chance of survival than one which attempts to infuse a large dose of Analysis.

De Morgan's text is certainly not ideal for a beginner. But it is certainly a very effective treatise for an Honours graduate who has learnt his calculus from other textbooks and now wishes to round off his knowledge of the entire subject. It is also a very suitable reading material for a mature level History of Mathematics class for students of Mathematics (it is replete with historical references and rich in polemical asides). It seems to be a very important landmark in England's transition from the Newtonian brand of Calculus into the Continental style. (A reprints publication agency would do well in bringing out a reprint edition.) To my knowledge, De Morgan's book was never translated into any language. It may rank in importance to the two-volume work by Chrystal on Algebra. A.L. Cauchy's Cours d'analyse published in 1821 was an instant success. About this book Abel wrote in 1826: This excellent work must be read by every analyst who loves rigor in mathematical research. "Mathematicians learned from Cauchy's Cours d'Analyse and other texts, Résumé des Lecons sur le calcul infinitesimal (1923) and Lecons sur le calcul differentiel (1829) new habits of doing calculus, a new awareness of continuity and convergence, testing series for convergence, care with Taylor's series, a rigorous definiton of definite integrals as limits of sums, a greater freedom from anxiety while dealing with infinite processes. Cauchy took care not to compress entire body of Calculus and Analysis in one single book. His

books though difficult for students were a delight for the teachers of Calculus, who could now feel less uneasy in talking about infinite processes.

De Morgan was firmly committed to the need for absolute rigor in whatever he wrote, whether in the areas of mathematics or logic. Today De Morgan is better known as a Logician. On the other hand, Cauchy did not care overmuch for rigor in his research papers. Abel found his papers 'very confused (brouillé), hardly anything comprehensible at first'. In writing his Cours Cauchy did merely what had to be done by someone anyway. He was not obsessed with questions of rigor when he in his research papers operated on series, on Fourier transforms on improper and multiple intregrals. For a creative mathematician like Cauchy, rigor had to take a second place. For De Morgan rigor remained supreme.