Suggested Paper Topics—1500 and Beyond

1. Philosophy of mathematics, and the nature of mathematical truth and thinking, as considered in the writings of (for example) Pascal, Descartes, Berkeley, Bertrand Russell, A. N. Whitehead, Ludwig Wittgenstein, L. E. J. Brouwer, Kurt Gödel, G. H. Hardy, David Hilbert. Or: the philosophical controversies surrounding: infinite sets, the idea of the limit, the Axiom of Choice, constructive mathematics, undecidability, computability.

2. The development of important mathematical concepts: continuity; the integral; the real numbers; statistical independence.

3. Mathematics and society: Ronald Fisher (the founder of the modern science of statistics); John Maynard Keynes (economist and mathematician; he worked on probability theory); George Gallup (invented modern opinion polling); insurance (how are premiums computed?); epidemiology (the government says that 350,000 people die from smoking-related causes every year—where do they get that figure?).

4. Women in mathematics: Maria Agnesi, Sophie Germain, Sonya Kowalevskaya, Emmy Noether, Olga Todd, Cathleen Morawetz, Olga Ladyzenskaya.

5. Interactions between mathematics and science and engineering: Denis Gabor and holography; Ronald Graham and his work at Bell Labs; Claude Shannon and information theory; Norbert Wiener and cybernetics; John von Neumann and several things (digital computers, quantum mechanics, game theory); James Clerk Maxwell and electromagnetism; Alan Turing and computers (also cryptography); the discovery of Neptune; Gary Flandro and the Voyager mission; the Global Positioning System; Friedrich Bessel and the measurement of parallax; James Bradley and the discoveries of nutation and the aberration of starlight.

6. Puzzles and fun: sudoku; John H. Conway's Game of Life; Sam Loyd's many puzzles (such as "Get off the Earth" and the '15' puzzle—see Martin Gardner's *Mathematics, Magic, and Mystery*); logic puzzles (such as the "Liar" paradox—see Raymond Smullyan's *What is the Name of this Book?* for a good bundle of puzzles); Lewis Carroll's many, many mathematical recreations.

7. Celebrated problems: computing the digits of $\pi$; the Poincaré Conjecture; the Dinitz Conjecture (proposed by UVM's own Prof. Dinitz); the "perfect square" problem; the Riemann Hypothesis; Goldbach's Conjecture; Fermat's Last Theorem.

8. Talented outsiders: N. Bowditch (American navigator); S. Ramanujan (Indian number theorist).

Don't be limited by this list. In the fall of 2006 I received a beautiful paper about a ballet based on Euclid's geometry. Try to surprise me! However, I **strongly** urge you to discuss your paper topics with me before beginning your research.