Institute for Mathematics and its Applications
2011 Colloquium
University of Wollongong

Title: Voltaire's Riddle and the shape of the earth

Speaker: Andrew Simoson (King College, Bristol, TN, USA)

Time and Date: 11:30am, Thursday, July 21, 2011

Location: Room 24.105

Abstract: In 1752, Voltaire wrote a story, Micromegas, about the French expedition to the Arctic whose purpose was to test Newton's controversial theories about gravity. In an imaginative twist to the actual events, Voltaire has an alien giant intercept the French mathematicians on their return trip, and chats with them about how it is that they know what they know, and leaves them with a blank book that supposedly contains all knowledge. Although we may mention a few items that pertain to this riddle, we focus on the underlying mathematical controversy. Specifically, Newton had claimed that the difference between earth's equatorial and polar radii, r, was about 17.1 miles so that the earth was shaped as a mandarin orange, whereas the continental mathematicians by and large maintained that the earth bulged at the poles in the shape of a lemon.

We briefly show how Newton arrived at his estimate in 1692, and demonstrate that his guess—because his model was flawed—was extremely lucky to be so near the actual value of r. When we use the two arclength measurements cited by Newton in the Principia (one measured by Richard Norwood near London in 1637 and the other measured by Jean Picard near Paris in 1670), we find that r should be about 92 miles. However, when using the results of the twin eighteenth century French geodesic surveys, namely the arclengths of one degree along the surface of the earth both at the equator and the arctic circle, we find the resultant r calucation to be very close to its true value, a remarkable tribute to those who took such careful measurements some 270 years ago.

Bibliography: Professor Simoson received a PhD in Mathematics in 1979 under Dr. Leonard Asimow at the University of Wyoming where he worked on extensions of separation theorems in infinite dimensional spaces. Since then he has been chairman of the Mathematics Department at King College in Bristol, Tennessee, except for two Fulbright sabbatical years, at the University of Botswana and the University of Dar es Salaam. King College is a Presbyterian-affiliated, master's level comprehensive college structured on a university model situated on 135 wooded acres with Georgian-style architecture buildings.