Mike Stillman:Â **Applications of computational algebraic geometry to vacuum
moduli spaces of supersymmetric models in physics**

Given a supersymmetric potential function, such as one for the MSSMÂ (minimal super-symmetric extension of the standard model of particleÂ physics), there is a naturally associated affine algebraic variety,Â which is (essentially) the moduli space of possible vacua of theÂ theory. Â In this talk we describe the structure of some of theseÂ moduli spaces, including the Electro-weak sector of the MSSM, whichÂ were obtained with the help of computational algebraic geometry andÂ Macaulay2. Â We consider theories where one allows for more than 3Â generations of particles. Â Since nature seems to have chosen
3Â generations, theories for which this number of generations is forcedÂ would be ideal. Â Although it does not appear that 3 generations isÂ forced here, we see how the geometry varies with different numbers ofÂ generations of particles.

We will assume no knowledge of physics during this talk. Â We willÂ briefly describe the physics needed, and then we willÂ describe the algebraic geometric and computational methods and resultsÂ which allow the structure to become apparent.

This talk is based on joint work with the following authors,Â some of which appears in the recent paper arxiv.org/1408.6841.Â Joint work with:

Yang-Hui He (Oxford and City University London, UK)
Vishnu Jejjala (University of the Witwatersrand, Johannesburg, South Africa)
Cyril Matti (City University, London, UK)
Brent Nelson (Northeastern University, USA)