Mathematics Colloquium — Spring 2008 Series

Thursdays | Behavioral and Social Sciences 204 | 4PM

Special Colloquium — January 25

Speakers identity confidential. Please note that this talk has a special day and place: Friday, January 25 in BSS 204.

Special Colloquium — February 1

Speakers identity confidential. Please note that this talk has a special day and place: Friday, February 1 in BSS 204.

Special Colloquium — February 4

Speakers identity confidential. Please note that this talk has a special day and place: Monday, February 4 in BSS 310.

Modeling Local Population Recovery of the Western Snowy Plover — February 14

Chris Panza, College of the Redwoods. The coastal population of the western snowy plover is listed as a threatened species. In Humboldt County nest exclosures have been used to protect nests and increase the number of chicks hatched in an attempt to help the population recover. This model looks at the effects of the nest exclosures on the local population to try and determine their effectiveness.

Coxeter Groups, Hecke Algebras and Chain Complexes of Modules — February 21

Filix Maisch, PhD Student, UC Santa Cruz. We begin by looking at Coxeter groups, the associated combinatorics, including some concrete examples. We describe the Hecke algera, as a twist of the group algebra of a Coxeter group, where the braid relations are preserved, but the simple reflections are deformed. Then we pay particular attention to the Hecke algebras of the symmetric groups, and we look at modules over this algebra which has deep connections to the representation theory of the finite general linear groups.

Economic Impact and Input-Output Analysis — February 28

Beth Wilson, Professor of Economics, Humboldt State University. An economic impact study estimates the impact of an increase in economic activity as it filters through the economy. The total impact is larger than the initial boost because of the multiplier effect. `IMPLAN` software uses an input-output model of the economy to estimate the multiplier effects and the total economic impact. I will explain the model and the multiplier concept and show an example of how `IMPLAN` works.

"Formal" Integration — March 6

John Blattner, Emeritus Professor of Mathematics, California State University, Northridge. The "Formal" in the title refers to the modern use of differential forms in geometry and analysis. The talk will attempt to give insight into "formal" methods by reconciling them with the good old (18th and 19th century) methods of integration. Examples of both old and new methods will aim at clarifying the underlying ideas of the"formal" methods.

But Is It Art? — March 13

Brad Shelton, Professor of Mathematics and Department Head, University of Oregon. A few years ago I became fascinated with a deceptively simple geometric construction known as a Maurer Rose (*American Math. Monthly*, **94**, (1987), 631-645). These objects are produced by an algorithm which combines some simple polar coordinates, simple number theory and even Fourier Series. A simple but perfectly good example of a Maurer Rose would be a pentagram. Indeed every Maurer rose is just some sort of (very complicated) "star." My fascination stems from the fact that for most choices of parameters, Maurer Roses are "ugly," but for some choices they are quite "beautiful." I would go so far as to say that they become "art." This leads to the very difficult question of whether or not it is mathematically possible to describe when the objects are inherently attractive.

A Model of a Crocodilian Population Using Delay-Differential Equations — March 27

Angela Gallegos, Professor of Mathematics, Occidental College. The crocodilia have multiple interesting characteristics that affect their population dynamics. They are among several reptile species which exhibit temperature dependent sex determination (TSD) in which the temperature of egg incubation determines the sex of the hatchlings. Their life parameters, specifically birth and death rates, exhibit strong age-dependence. We develop delay-differential equation (DDE) models describing the evolution of a crocodilian population. In using the delay formulation, we are able to account for both the TSD and the age-dependence of the life parameters while maintaining some analytical tractability. I will discuss the model formulation and analysis as well as compare our results to biological data.

Some Roots of Roots — April 3

Martin Flashman, Professor of Mathematics, Humboldt State University. Solving, or finding roots of, equations has a long and varied history. Professor Flashman will provide a look at some of that history of from Euclid through Abel and Galois. Included will be both some exact and estimation approaches taken from illustrative original sources.

Early Navigational Instruments and the Determination of Latitude — April 10

Richard A. Paselk, Professor of Chemistry, Humboldt State University. Navigation was revolutionized with mathematical instruments under Henry the Navigator in 15th century Portugal. We will explore the problem of determining place, the mathematics needed, the instrumental solutions and the evolution of main instruments to the 17th century. Model instruments will illustrate the talk.

A New Calculus — April 17

Don Albers†, Editorial Director of MAA Books. Some relatively unknown elementary geometrical methods dating back only fifty years enable novice mathematics students to solve several ferociously difficult calculus problems, including many well beyond students of advanced calculus. In the space of fifty minutes, you,too, will learn methods that will dazzle your mathematical friends.

John von Neumann and the Origins of Scientific Computing and Computer Science — April 24

Joseph Grcar, Lawrence Berkeley National Laboratory. Computer science and scientific computing have little in common besides the transposed names, today, but at the time of their origin in the 1940s they were essentially the same subject. Manual scientific computing began to be practiced much earlier, around the time of Carl Friedrich Gauss, in the form of astronomical calculations for marine navigation and geodetic calculations for cartography. The invention of modern computers (those digital, electronic, and programmable) in the mid 1940s represented a paradigm shift in what could be achieved through calculation. From his wartime military duties John von Neumann acquired what he described as an "obscene" interest in mechanized calculations. No one was better situated than he to understand the advances that could be realized but also the whole range of technical obstacles that had to be overcome. Thus von Neumann and his principal collaborator in this work, Herman Goldstine, largely reinvented scientific computing in the late 1940s. As a necessary prerequisite to that work they also created computer science though a series of influential reports that described the design and use of the computers being built first at the University of Pennsylvania and later at the Institute for Advanced Study. This talk will survey the development of scientific computing from Gauss to the first electronic calculations in the early 1950s. The emphasis in not on von Neumann himself but rather on the conceptual changes that occurred. He arises naturally in the story because many of those changes can be traced to him. If time permits it may also be possible to sketch von Neumann's biography.

Mapping the Three-Sphere — May 1

Peter Littig, Professor of Mathematics, University of Washington, Bothel. The three-dimensional sphere, denoted S^3, is an intriguing space, exhibiting a rich blend of algebraic, geometric, and topological properties. In this talk we'll explore S^3 by first generalizing Earth's system of latitude and longitude lines and then studying the algebraic significance of these structures. Along the way we'll discuss the quaternions, the special unitary group SU(2), and the Hopf map $S^3 \longrightarrow S^2$, one of topology's most famous constructions.

† **Spring 2008 Kieval Lecturer**

Humboldt State University