Topics Seminar
Stat 991 – **302**[1]
Time: Thursdays at 3 – 6pm. Place: JMHH - G94

Excursions in Statistics and Probability

This year's excursions will be presented by two distinguished researchers –

Larry Shepp[2] and Henry Wynn[3]

Each lecturer will present a series of (probably) four extended (3-hour) lectures on a topic or topics[4] of his choice.

This course of seminars will be piloted by L. Brown. Participants in the seminar will engage in reading and group investigations to prepare for and supplement the formal presentations by Shepp and Wynn. **Grades will be given based on the student presentations or on the basis of a short written report pursuing some aspect of one of the guest lectures**. Students (at all levels of doctoral study in statistics or related fields) are encouraged to register for the seminar course and hence participate in the group discussions.

Others who are interested are invited to attend the formal lectures. To the extent feasible separate announcements will be circulated giving the dates and titles of the individual lectures.

It is expected that Larry Shepp will lecture in September – October and Henry Wynn will lecture in October – November.

NOTES:
1. There are two "Topics Seminar" courses this semester – Stat 991-301 (presented by T. Cai). and Stat 991-302. In spite of the partial overlap of course designations these are two entirely separate courses and students may register for either or both.

2. For some information about Larry Shepp access http://www.stat.rutgers.edu/~shepp/ .

3. For some information about Henry Wynn access
http://www.lse.ac.uk/collections/cats/People/HenryPage.htm .

4. **See below** for a description by Larry Shepp of his first two lectures on "gambling theory and martingales". For the remaining two lectures Larry has suggested talking about his work on diabetes and or on genomics, as indicated by student interest. For a recent abstract of a presentation by Shepp on diabetes management see
http://www.math.miami.edu/anno/colloquium.htm .

Henry Wynn plans to talk about his work on “algebraic statistics”. For further information about this topic consult the references listed on his web-site

Gambling Theory
Larry Shepp

Shepp will start out with two talks on gambling theory, which has indirect connections to finance, as was seen in recent Wall Street history. The problems in this area deal with the following scenario: a gambler has run up a large debt with the mafia and will be killed if he does not pay it back by tomorrow. He has only a fraction *f* of his debt, and hasn't got enough time to give a sufficient number of lectures to raise the money needed, so he is forced to continue gambling with his current fortune, $f < 1$, which he needs to turn into a fortune of size one. He is in a casino where he may stake any amount $s \le f$ at even money (in the simplest casino) but with win probability $w = .49 < 1/2$. If he wins he has doubled his stake and so his new fortune is $f + s$ with probability w but if he loses the bet then his new fortune is $f - s$, with probability $1- w = .51$. If he ever reaches fortune one he intends to leave and never to gamble again, but if he reaches fortune zero before fortune one, he dies. How should he stake his bets so as to maximize the probability to remain alive? The solution is intuitive: the gambler can do no better than to risk it all, setting $s = f$, if $f \le 1/2$, or just enough to reach fortune 1, setting $s = 1- f$, if $1/2 \le f < 1$. This strategy is called (modified) bold play and some similar bold strategy seems to have been used by several banks in the recent bundled mortgage meltdown; so it seems rather insightful into how gamblers behave. Yet things are not quite so simple as they may appear, and maybe gamblers ought to study martingale theory:

- First, the solution is far from unique.
- Second, in slightly more complicated casinos the solution is unknown. For example, if the fortune is reduced by 1% after each bet, win or lose, the optimal solution is even more intuitively to play boldly, but it is false! We will discuss this class of problems as a way to motivate martingale theory and we shall learn how to apply martingale theory to solve those problems we can solve.