Sixth Annual Bahadur Memorial Lectures

The Department of Statistics is proud to present the Sixth Annual Bahadur Memorial Lectures in honor of Raj Bahadur's fundamental contributions to statistics and to our department.

We are pleased to have **Willem R. van Zwet**, Professor of Mathematical Statistics and Probability from the Mathematical Institute, University of Leiden, as our honored speaker.

"Statistics and the law: the case of the negligent nurse"

Kent 107, 1020 East 58th Street
Monday, May 16, 2005 at 4:00 PM

"Kakutani's interval splitting scheme"

Kent 107, 1020 East 58th Street
Wednesday, May 18, 2005 at 4:00 PM

Statistics and the law: the case of the negligent nurse

Willem R. van Zwet, University of Leiden

In a hospital in The Hague a number of unexpected cases of death or reanimation of patients occurred. When it was found that in all of these cases a nurse named Lucia was present and caring for these patients, she was arrested and tried for multiple murder. The case for the prosecution rested on toxicological evidence as well as a statistical analysis showing that her presence in all cases could not be attributed to chance. On the basis of this Lucia was sentenced to life imprisonment.

The case was appealed by the defendant and considered by the Appellate Court (Gerechtshof) in The Hague. The defense now produced another expert witness who claimed that the statistical evidence presented earlier was unconvincing. In an interview in a leading Dutch newspaper a third expert went quite a bit farther and claimed that the statistical analysis was completely wrong and when performed correctly, should have led to a verdict of not guilty. In the resulting confusion the court made it clear that it could not credit any of the statistical arguments anymore and confirmed the life sentence without mentioning the word statistics at all, though clearly still impressed by the unlikely presence of the defendant in all cases.

It seems that the various experts have succeeded only in confirming the wellknown distrust of statistical arguments that goes back to Disraeli's dictum that there are lies, damned lies and statistics. In this talk I'll try to explain that if the ordinary rules for statistical consulting had been followed, it would have been quite clear what statistics could and could not contribute to this case.

Kakutani's interval splitting scheme

Willem R. van Zwet, University of Leiden

Put a random – i.e. uniformly distributed – point X_1 in the unit interval (0.1). Choose the longest of the resulting two subintervals $(0, X_1)$ and $(X1,1)$ and put a random point X_2 in this interval. Continue in this way, choosing X_k randomly in the longest of the k intervals into which $X_1,X_2,…,X_{k-1}$ subdivide (0,1). Kakutani asked whether in the long run the points become evenly – i.e. uniformly - distributed in (0,1). There are obvious reasons why this should be true, but the proof turned out to be a different matter altogether.

Once we have a proof, we can resolve some related matters. For instance, one can ask how the speed of convergence compares with well-studied classical case where the random variables $X_1,X_2,…$ are independent and uniformly distributed on (0,1). While answering this question we come across some interesting and unexpected phenomena. All of this is based on joint work with Ronald Pyke.