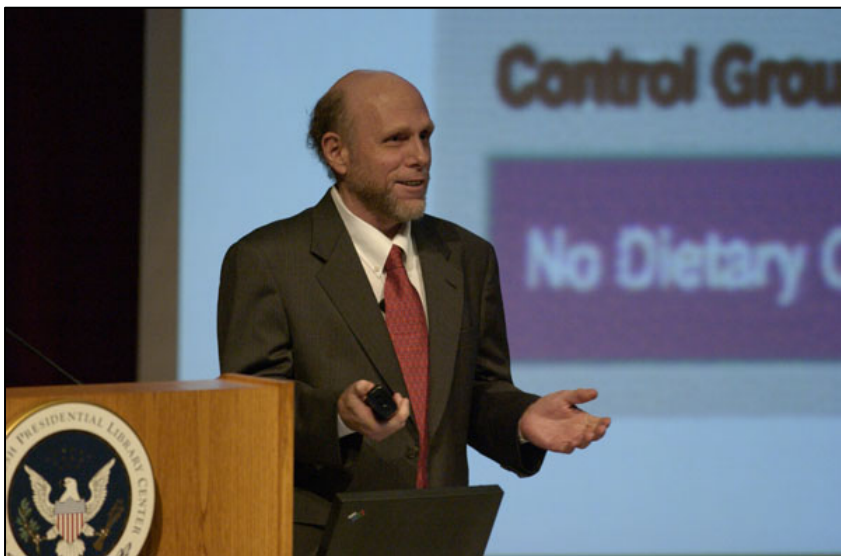


The Department of Statistics and Applied Probability  
Presents

# Raymond J. Carroll

## Semiparametric methods for gene-environment case-control studies

March 15, 2006 **SOBEL LECTURE**  
3:15 pm, Refreshments served at 3 pm  
South Hall 5607F



Raymond J. Carroll is a Distinguished Professor of Statistics, Nutrition, Toxicology & Epidemiology and Biostatistics at Texas A&M University. He is the Director of the Bioinformatics Training Program and Core Director of the Center for Environmental and Rural Health

I will consider population-based case-control studies of gene and environment interactions using prospective logistic regression models. In many cases of such studies, it is reasonable to assume that genotype and environment are independent in the population, possibly conditional on covariates to account for population stratification. We develop a modern semiparametric likelihood approach for this problem, showing that it leads to much more efficient estimates of gene-environment interaction parameters and the gene main effect than the standard approach: decreases of standard errors for the former are often by factors of 50% and more. In addition, if the probability of disease is known in the population, we show efficiency gains for estimating gene-environment interactions, again in contrast to the standard approach. Multiple extensions are discussed, with applications to an important data set involving the BRCA1/2 mutation and the question as to whether use of oral contraceptives decreases risk in women with this mutation. The most important extensions are to the problems of missing genotype data (our example) and unphased haplotype data.

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