Marion R. Reynolds, Jr.
Professor of Statistics and Forestry Biometrics, Virginia Tech, Blacksburg, Virginia

Dr. Marion R. Reynolds, Jr., serves in a joint appointment as Professor of Statistics and Professor of Forestry Biometrics in the Departments of Statistics and Forestry at Virginia Tech, Blacksburg, Virginia. He has served at Virginia Tech since receiving his Ph.D. from Stanford University in Operations Research in 1972. From his first publication in 1974 in the Annals of Statistics to the most recent 2007 publication in Technometrics, Dr. Reynolds has published nearly seventy refereed research papers in top statistics journals. Dr. Reynolds is a leading researcher in the area of statistical process control, with a particularly strong focus on sampling issues. Some of his recent work has been on applications of control charts in health-related monitoring. Dr. Reynolds became an Elected Member of the International Statistical Institute in 1999 and a Fellow of the American Statistical Association in 2000. He received the prestigious Brumbaugh Award from the American Society for Quality twice, first in 1996 and then again in 2004. Among his many other accomplishments he was awarded the Institute of Engineers (IIE) Transactions Best Paper Award in 1996 and the Certificate of Teaching Excellence, 1987-88, at Virginia Tech. He has directed the research of twenty Ph.D. students, several of whom have gone on to gain international reputations in statistics.

"Control Charts for Monitoring the Mean and Variability of Multivariate Processes with Sequential Sampling"

Abstract: Control charts are used to monitor a process to detect changes in the process that may occur at unknown times. Control charts are applied by plotting statistics computed from samples taken from the process. The traditional Shewhart control charts used for process monitoring are based on plotting statistics that are functions only of the data in the current sample. This talk briefly reviews the traditional Shewhart charts, and then discusses extensions in several directions. Shewhart charts are not effective for detecting small changes in the process, so extensions to more effective control charts that accumulate past information are discussed. The traditional Shewhart charts are designed for monitoring one process variable, but multiple process variables will be of interest in many applications. Extensions to multivariate control charts designed to monitor the process mean and variability are discussed. The traditional approach to sampling from a process is to take samples of fixed size at sampling points equally spaced in time. Thus traditional control charts are fixed sampling rate (FSR) control charts based on sampling from the process at a fixed rate. Here we discuss variable sampling rate (VSR) control charts in which the sampling rate changes as a function of the data from the process. With VSR control charts the sampling rate is increased whenever there is some indication of a possible change in the process, and decreased when there is no indication of a change. One approach to VSR control charts is based on sequential sampling in which the sample size used at each sampling point is a function of the data from the current and past sampling points. Sequential sampling will be discussed here in the context of simultaneously monitoring both the mean and variability of a multivariate normal process. Compared to traditional FSR control charts, using control charts based on sequential sampling can significantly improve performance in detecting most process changes.