IN MEMORIAM
DR. JOHN ALBERT FLUECK
1933- 2003

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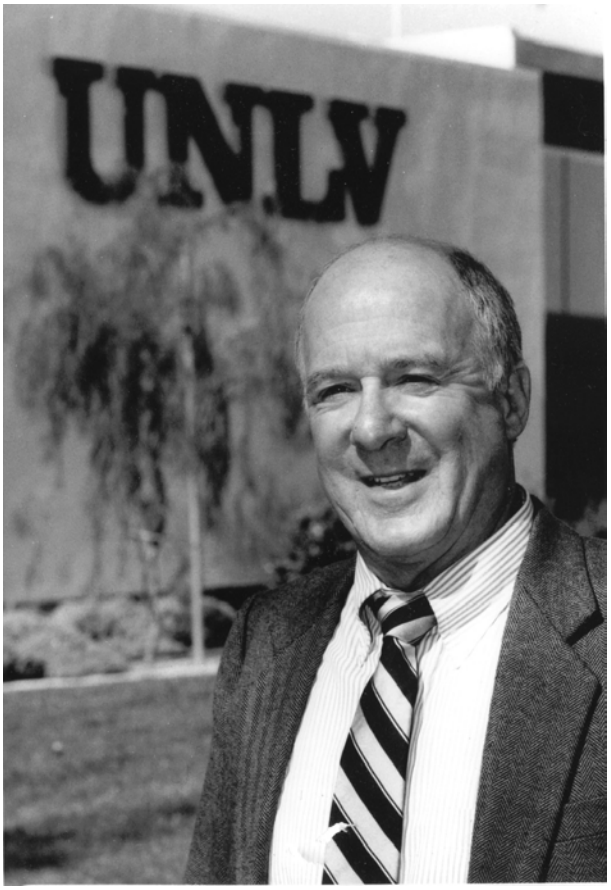

A Las Vegas colleague attended a lecture on quality in business. The lecture was unimpressive, but he wondered, "*Who is this fellow up front who thinks he is the keeper of the intellectual property of the world*?" An introduction led to a very productive relationship, and a deep appreciation for John Flueck. John, 70, died September 25, 2003 in Las Vegas. He was born in Cincinatti on April 13, 1933, and retired as a Visiting Professor, Department of Management, University of Nevada Las Vegas (1992-1998) where he previously served as Director of the Environment Statistics and Modeling Division, Harry Reid Environmental Research Center. He moved to Las Vegas from Boulder, Colorado, where he worked as a Senior Research Fellow at the National Atmospheric and Oceanic Administration and the National Center for Atmospheric Research.

In the late 1970's, Merlin Williams of NOAA's Weather Modification Program Office hired John Flueck to critique the Florida Area Cumulus Experiment, directed by a WMA past-President, Bill Woodley. Sparks flew as John took on his standard role as an abrasive "Grand Inquisitor". However, John knew his statistics and how to run a randomized cloud seeding project, and Bill and John eventually developed the mutual respect of a very beneficial friendship. Bill notes that he "even found John's irreverent behavior refreshing—as long as someone else was on the receiving end; he made life and science enjoyable and interesting with his keen, sarcastic wit and sharp mind." John may be forgiven for his lack of social graces, which he more than made up for with his parched but provocative humor that could invoke intense laughter and insight in the direst of situations.

In weather modification in the 1980's, John emphasized the steps in the physical chain of events in designing experiments as a means to remove just one or two levels of uncertainty, to move emerging experimental results beyond gridlock. He promoted high standards as he participated in evaluations and workshops on the Greek hail-suppression and Thailand rain-making experiments, among many others. The depth and breadth of John Flueck's knowledge and energy is evident from his accomplishments. He received his MBA and PhD from the Graduate School of Business, University of Chicago. He co-established the Dept. of Statistics, Temple University and the Statistics in Sports section of the American Statistical Association. The reason for the latter is clear: He was an intense competitor in skiing, tennis, sailing, soccer, football and track. He served as a consultant to the NCAA, EPA, NSF, DOE, and the FAO and WMO of the United Nations, and published some 100 papers in statistics, atmospheric science, climate, environmental sciences, data graphics, and business quality and productivity improvement. He served in the Office of Statistical Policy, OMB, Executive Office of the President and on the Malcolm Baldridge National Quality [in business] Award Board, and helped to found the Nevada Governor's Awards for Performance Excellence. John was a Fellow of the American Statistical Association and the American Association for

the Advancement of Science. Even so, he was always modest.

John's second wife, Judit, herself an astute and strong personality, accuses me, affectionately, of instigating their marriage. Her escape from a communist block country prepared her well for managing John. Three sons, Alex, David, and Michael, and stepson Mark, all speaking at the memorial service, recalled how John carried his constant probing to the dinner table, offering them daily challenges as they were raised by the disciplinarian who described himself as the "Prussian Colonel." In the end, their mutual great fondness and highest regard for this unusual father and husband is very evident. Colleague Bill Hooke of NOAA, now at the AMS, notes appropriately that "life was always a little better after you talked with John". This brilliant man ironically and tragically succumbed to a dementia related to Alzheimer's and Parkinson's disease. With my own deep appreciation for John, I sorely miss the Grand Inquisitor and Drought-dry Humorist, a professional and personal dear friend.

Roger F. Reinking

THE SOUTHERN OGALLALA AQUIFER RAINFALL (SOAR) PROGRAM – A NEW PRECIPITATION ENHANCEMENT PROGRAM IN WEST TEXAS AND SOUTHEASTERN NEW MEXICO

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Abstract. The Sandy Land Underground Water Conservation District, South Plains Underground Water Conservation District, and the Llano Estacado Underground Water Conservation District have participated with the High Plains Underground Water Conservation District #1 for a number of years in their precipitation enhancement program. Convinced from past assessments that precipitation enhancement is a potential water management tool, the three boards decided that a program beginning in 2002, apart from the High Plains would be beneficial. The Texas Department of Licensing and Regulation (TDLR) issued a permit on January 31, 2002 authorizing a weather modification program to conduct rainfall enhancement in Yoakum, Terry and Gaines County. Additionally, with the cooperation of the State of New Mexico, an area west of Gaines and Yoakum Counties is included in the target area. This precipitation enhancement program was named Southern Ogallala Aquifer Rainfall (SOAR) program. This document presents a brief summary of the SOAR 2003 annual report detailing an effort to systematically characterize the clouds, precipitation and the seeding effectiveness of the SOAR program. Independent evaluations show average rainfall increases of 68% and 52% in favor of a seeded cloud when compared to a matching control cloud. This results in an average estimated benefit/cost ratio of 235/1.

1. INTRODUCTION

A scientific evaluation of cloud seeding for rainfall enhancement requires several efforts designed to systematically characterize clouds and precipitation in order to determine their potential response to seeding. The two fundamental questions that SOAR has searched to answer during its first year of operation in 2002 were 1) whether the frequency of clouds in the area and the associated weather patterns warrant the need for a cloud seeding program, and 2) are the clouds that occur receptive to glaciogenic and/or hygroscopic seeding?

The SOAR program has defined specific long term objectives that would systematically characterize the clouds, precipitation and the seeding effectiveness of a rainfall enhancement program, including:

1. A climatology of thunderstorm tracks and cloud characteristics as recorded by weather radar over several years to determine the suitability of clouds and their frequency of occurrence.

2. A continued assessment of seeded versus non-seeded clouds by independent qualified evaluators using scientifically accepted methodologies and statistical methods.

3. Launching carefully designed field programs, using an instrumented cloud physics aircraft and weather radar during periods when a high frequency of convective clouds is observed or anticipated. The objective of the field studies should be to document: a) background concentrations, sizes and chemical composition of aerosols that participate in rainfall processes, b) size resolved nucleation processes at variable super saturations of hygroscopic aerosol particles and their effect on the cloud droplet spectra, and c) the degree of ice nucleation achieved by glaciogenic cloud base and cloud top seeding.

4. Assessment and improvements in the data collection of rainfall, with an emphasis on the integration of conventional methods (surface rain-gauges) with more frequently used methods that demonstrate better spatial coverage and temporal resolution (radar).

This report presents a summary of the efforts employed by SOAR to characterize the clouds, precipitation and the seeding effectiveness of the SOAR program and details the recommendations made that would improve on current achievements.

2. A CLIMATOLOGY OF THE SOAR TARGET AREA

The climate of the Llano Estacado Region is classified as a dry, steppe type. The region is characterized as semi-arid, with a wide range in temperatures. In an average year, about 80 percent of the annual rainfall occurs during the warm season (May through October). Monthly rainfall quantities ordinarily decline markedly in the colder months of