2015 Haagen-Smit Clean Air Awards

Honoring Air Quality Achievements

May 19, 2016

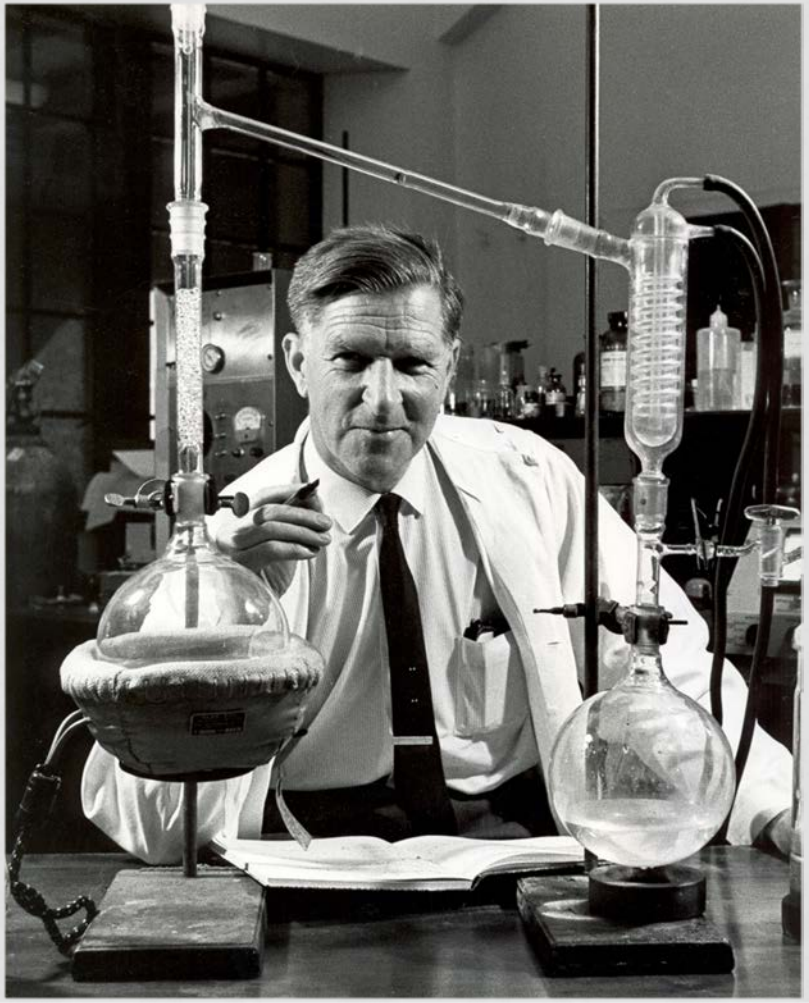
California Environmental Protection Agency
Air Resources Board

DR. ARIE J. HAAGEN-SMIT
1900 – 1977

- The “father” of air pollution control
- Linked smog in southern California to automobiles
- ARB’s first Chairman in 1968
- Awarded the National Medal of Science in 1973

DR. HAAGEN-SMIT

CALTECH OFFICE



DR. HAAGEN-SMIT

PLANT SCIENTIST

LOS ANGELES 1968

COVERED IN SMOG

DR. HAAGEN-SMIT

MOBILE LABORATORY

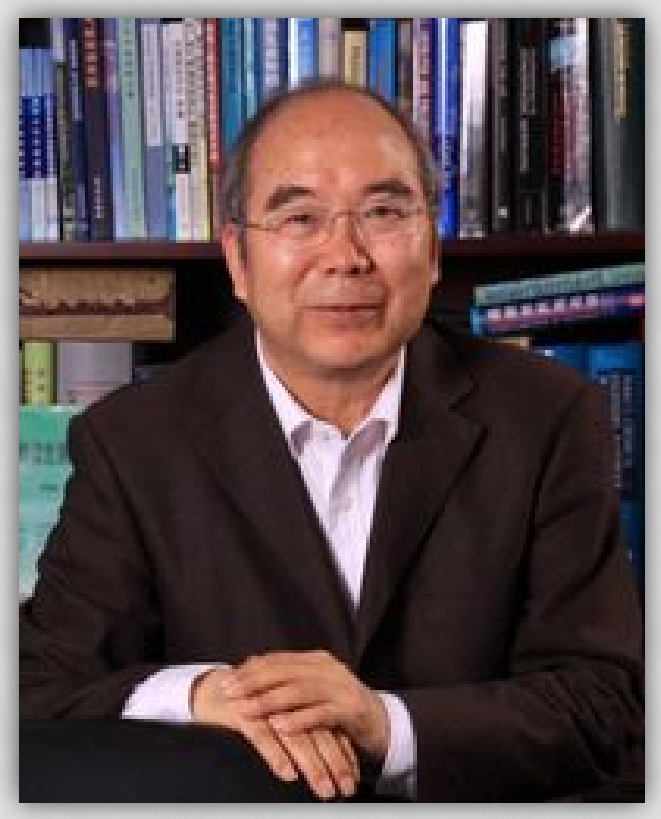
CHAIR HAAGEN-SMIT

AIR RESOURCES BOARD MEETING

BACKGROUND

- Awards began in 2001
- Two to three recipients selected each year
- Recognizes career contributions in improving air quality and climate change
- International nominations welcome

JIMING HAO, Ph.D.
INTERNATIONAL AIR POLLUTION CONTROL



- Professor and Dean in the School of the Environment, University of Tsinghua, China
- Leader and innovator in vehicle emissions identification and control
- Initiated clean vehicle program in multiple Chinese regions

DR. JIMING HAO

RESTORING BLUE SKIES FORUM - BEIJING

BLUE SKY AND WHITE CLOUDS

THE TEMPLE OF HEAVEN, BEIJING, JUNE 12, 2015

BEIJING OLYMPIC STADIUM – JULY 2008

ONE MONTH BEFORE GAMES BEGAN

DR. JIMING HAO

MEMBER OF THE ADVISORY COMMITTEE TO THE SHANGHAI EXPO 2010

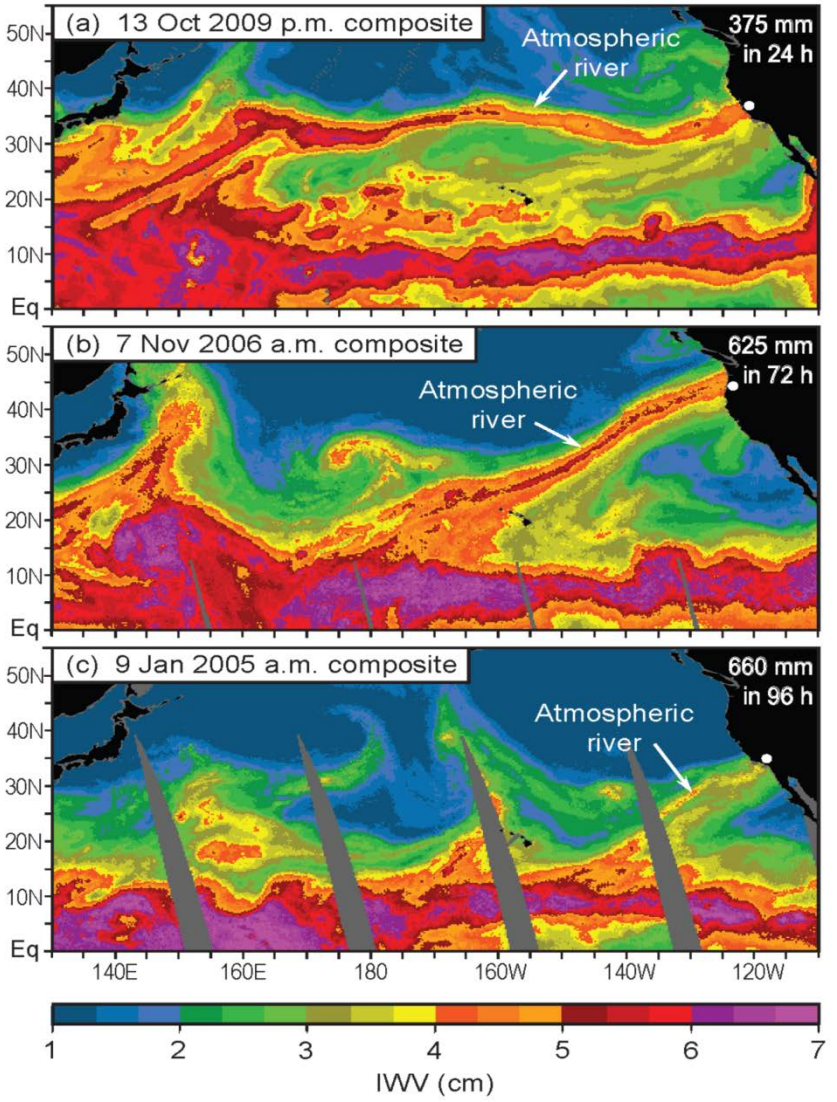
KIMBERLY PRATHER, Ph.D.
ATMOSPHERIC CHEMISTRY

- Professor of Atmospheric Chemistry, University of California, San Diego and Scripps Institute of Oceanography
- Director, Center for Aerosol Impacts on Climate and the Environment
- World-renowned expert in atmospheric aerosols

CENTER FOR AEROSOL IMPACTS ON CLIMATE AND THE ENVIRONMENT

SCRIPPS INSTITUTION OF OCEANOGRAPHY, UC SAN DIEGO CHEMISTRY

NOAA'S PARTICLE ANALYSIS BY LASER MASS SPECTROMETRY INSTRUMENT ABOARD THE NASA WB-57 HIGH-ALTITUDE RESEARCH AIRCRAFT.



NOAA'S ATMOSPHERIC RIVER INFORMATION WEB PAGE

IN FRONT OF PNNL G-1 AIRCRAFT TO STUDY CLOUD SEEDING.

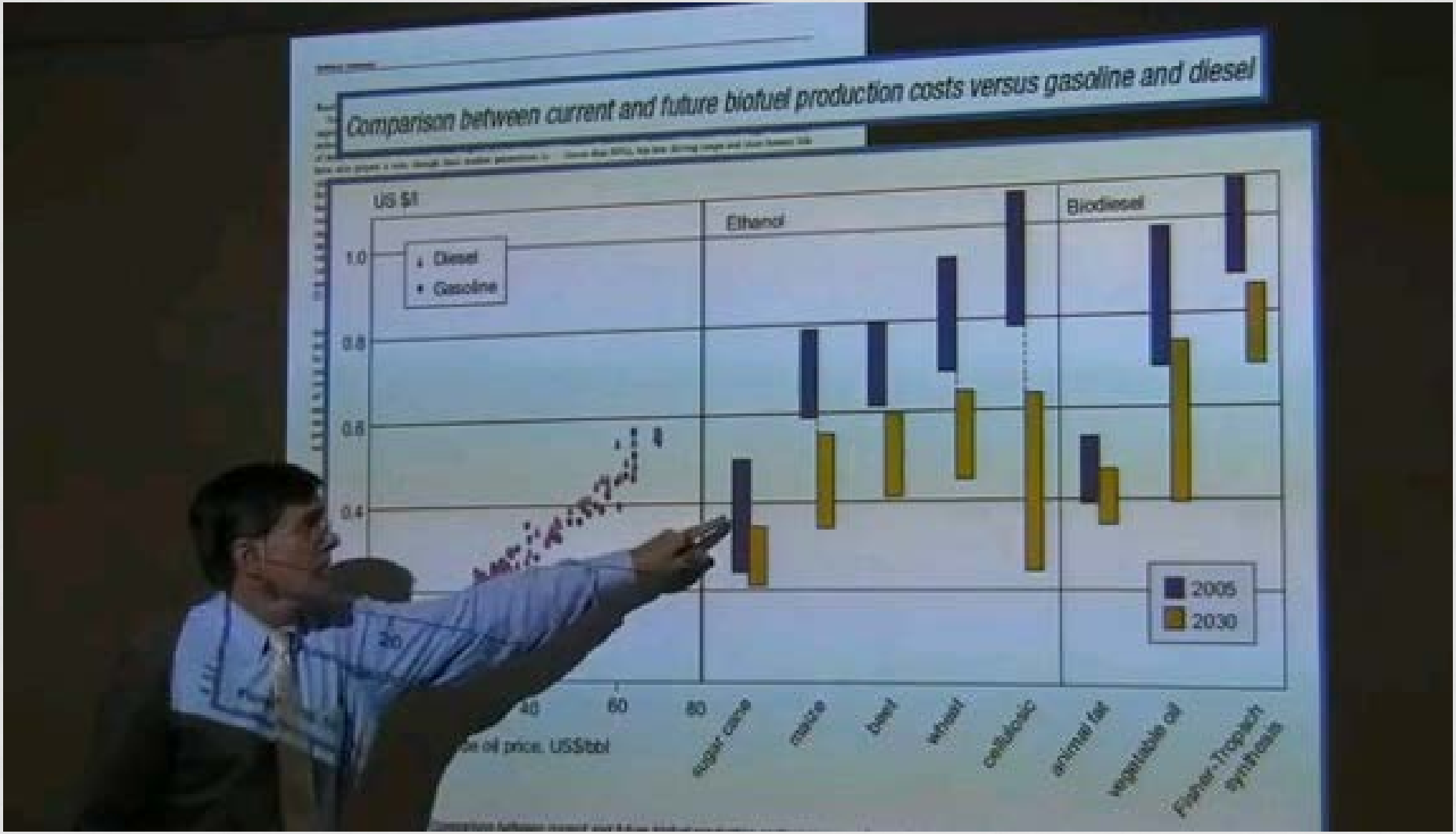
SCRIPPS INSTITUTION OF OCEANOGRAPHY

MICHAEL PRATHER, Ph.D.
CLIMATE CHANGE RESEARCH

- Professor of Earth System Science, University of California, Irvine
- Expert in scientific basis for international ozone and climate assessments
- Contributing and lead author in IPCC's Assessment Reports 1994-2014

PROFESSOR MICHAEL PRATHER

CONTRIBUTING AND LEAD AUTHOR IN IPCC'S ASSESSMENT REPORTS


Comparison between current and future biofuel production costs versus gasoline and diesel
US $/l
Ethanol
Biodiesel
Diesel
Gasoline
1.0
0.8
0.6
0.4
2005
2030
40
60
80
sugar cane
maize
beet
wheat
cellulosic
animal fat
vegetable oil
Fischer-Tropsch synthesis

JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 86, NO. C8, PAGES 7210–7254, AUGUST 20, 1981

Tropospheric Chemistry: A Global Perspective

JENNIFER A. LOGAN, MICHAEL J. PRATHER, STEVEN C. WOFSY, AND MICHAEL B. MCELROY

Center for Earth Planetary Physics, Harvard University, Cambridge, Massachusetts 02138

A model for the photochemistry of the global troposphere constrained by observed concentrations of H_2O, O_3, CO, CH_4, NO, NO_2, and HNO_3 is presented. Data for NO and NO_2 are insufficient to define the global distribution of these gases but are nonetheless useful in limiting several of the more uncertain parameters of the model. Concentrations of OH, HO_2, H_2O_2, NO, NO_2, NO_3, N_2O_5, HNO_3, HO_2NO_2, CH_3O_2, CH_3OOH, CH_2O, and CH_3CCl_3 are calculated as functions of altitude, latitude, and season. Results imply that the source for nitrogen oxides in the remote troposphere is geographically dispersed and surprisingly small, less than 10^7 tons N yr^{-1}. Global sources for CO and CH_4 are 1.5×10^9 tons C yr^{-1} and 4.5×10^8 tons C yr^{-1}, respectively. Carbon monoxide is derived from combustion of fossil fuel (15%) and oxidation of atmospheric CH_4 (25%), with the balance from burning of vegetation and oxidation of biospheric hydrocarbons. Production of CO in the northern hemisphere exceeds that in the southern hemisphere by about a factor of 2. Industrial and agricultural activities provide approximately half the global source of CO. Oxidation of CO and CH_4 provides sources of tropospheric O_3 similar in magnitude to loss by in situ photochemistry. Observations of CH_3CCl_3 could offer an important check of the tropospheric model and results shown here suggest that computed concentrations of OH should be reliable within a factor of 2. A more definitive test requires better definition of release rates for CH_3CCl_3 and improved measurements for its distribution in the atmosphere.

1. INTRODUCTION

The hydroxyl radical plays an important role in the photochemistry of the troposphere. Reaction with OH provides the dominant path for removal of a variety of atmospheric species including CO, CH_4, C_2H_6, H_2, CH_3Cl, CH_3CCl_3, CH_3Br, H_2S, and SO_2.

The chemistry of tropospheric OH is complex. Hydroxyl is produced by reaction of $O(^1D)$ with H_2O [*Levy*, 1971, 1972], with $O(^1D)$ produced by photolysis of O_3 near 300 nm. In addition to the direct source, OH may be regenerated by a suite of reactions involving HO_2 and H_2O_2. Rates for these reactions vary appreciably in both time and space reflecting fluc-

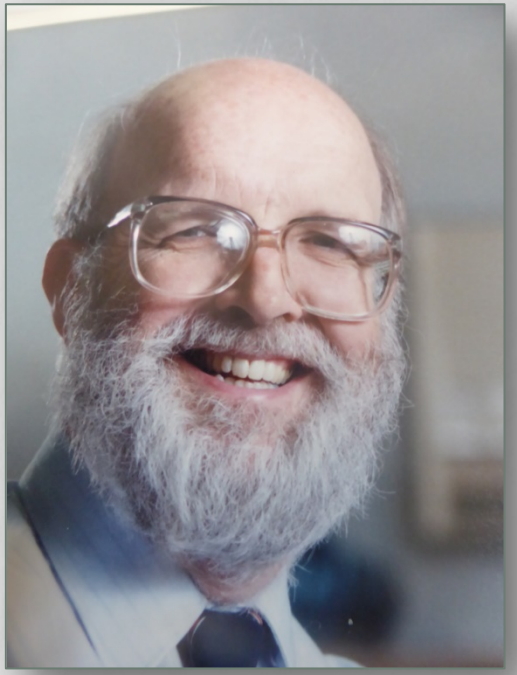
early models [e.g., *Levy*, 1972; *Wofsy et al.*, 1972; *Crutzen*, 1974] by a factor between 2 and 5. We shall argue here that the discrepancies suggested by such comparisons may be attributed to a combination of factors: lack of a global model for the troposphere, inadequate information on the distribution of gases such as NO and NO_2, uncertainties in rates for key reactions, uncertainty in release rates for CH_3CCl_3, and inadequacy of the data for atmospheric CH_3CCl_3. A more comprehensive analysis is given below.

An acceptable model for OH must be consistent with knowledge of budgets for other gases, in particular CO. Reaction with OH is the primary removal mechanism for atmo-

MICHAEL PRATHER'S HIGHLY INFLUENTIAL PAPER

MORE THAN 1,400 CITATIONS SINCE 1981

DONALD STEDMAN, Ph.D.
EMISSIONS CONTROL TECHNOLOGIES
(1945 – 2016)



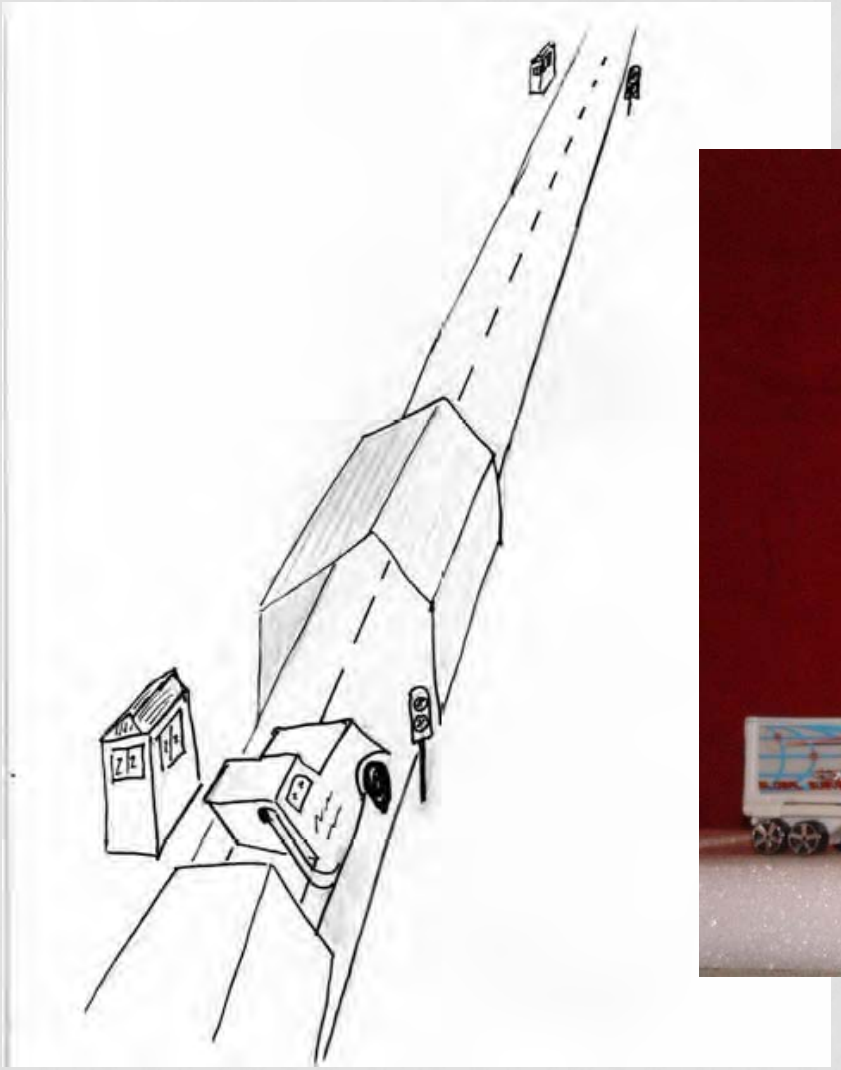
- Professor of Chemistry, University of Denver
- Leader in design and development of vehicle emissions testing devices
- Inventor of an on-road remote sensor for measuring in-use motor vehicle emissions

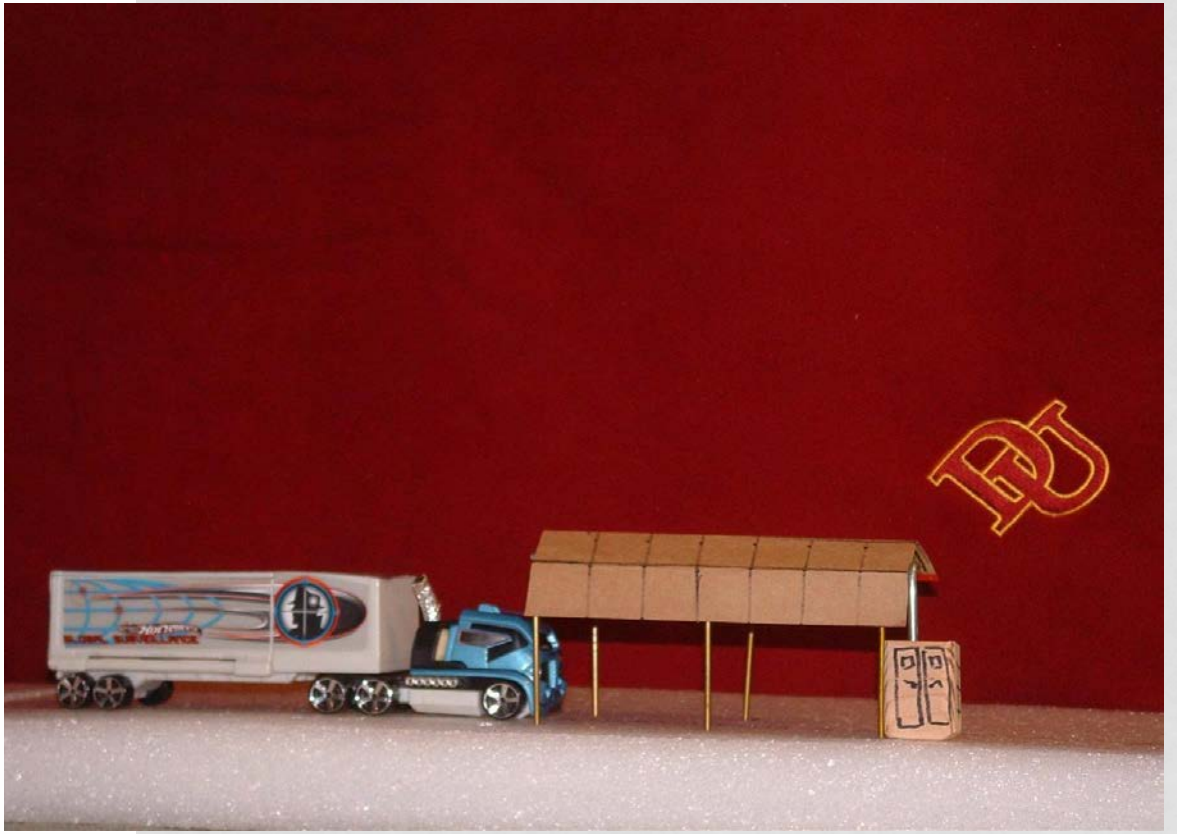
DU
gettyimages
Kathryn Scott Osler
161012021

PROFESSOR STEDMAN

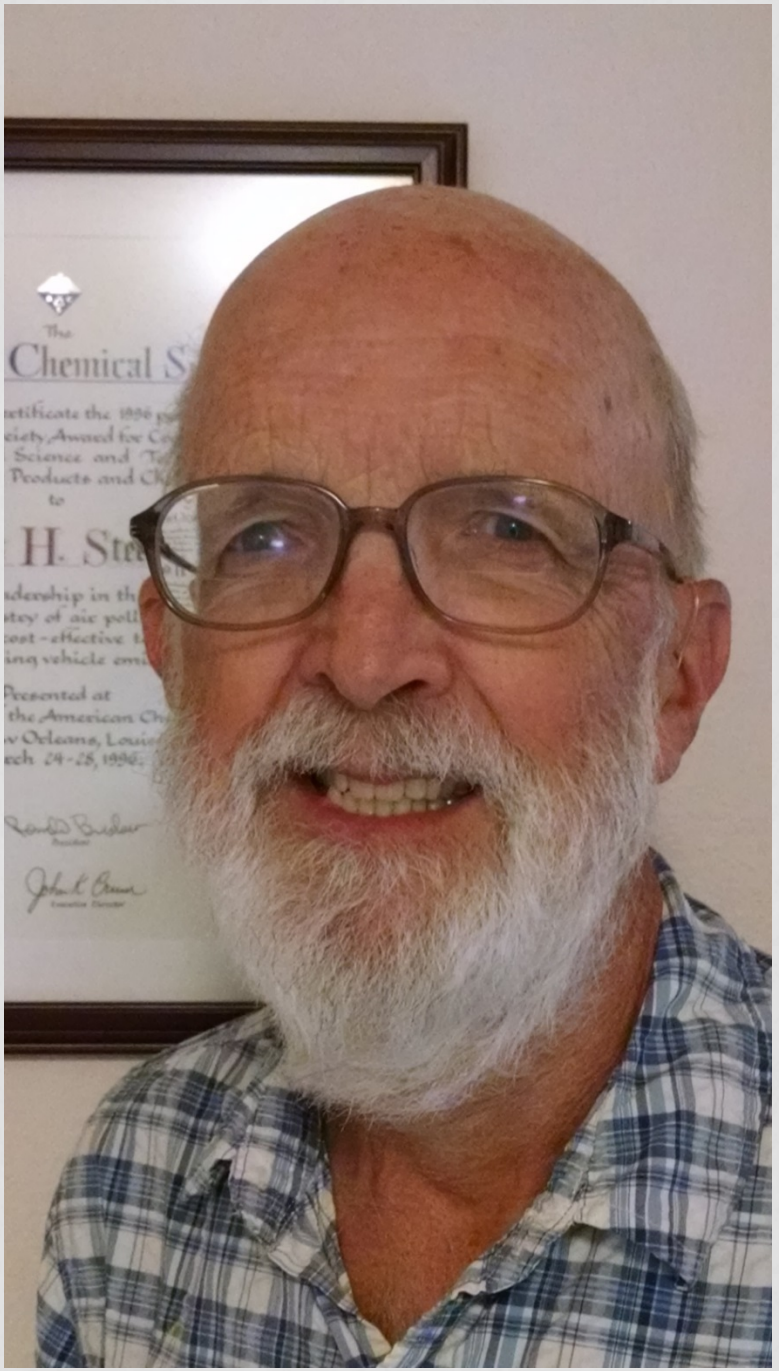
ON-ROAD HEAVY-DUTY MONITORING SYSTEM (OHMS)

How one of Don's Ideas got Funding





System and method for quantifying the presence of components in the exhaust of commercial and/or heavy-duty vehicles. US Patent 8,429,957, D.H. Stedman, 2013.



DON
Donald Stedman

THANK YOU!