



C. Matthews

CHARLES SEDWICK MATTHEWS

1920–2008

Elected in 1985

“For distinguished contributions to petroleum engineering technology and to development of public energy policy in the United States.”

BY GEORGE L. STEGEMEIER

DR. CHARLES S. MATTHEWS, Senior Petroleum Engineering Consultant for Shell Oil Company, and an internationally recognized Reservoir Engineer, died in Houston, Texas, on May 8, 2008.

Throughout his 45-year career with Shell, Dr. Matthews had a wide range of accomplishments, first as a technical contributor to the understanding of oil and gas reservoirs, then as a manager / director of research, and finally as an advisor to Shell and to federal and state representative bodies on broader aspects of the energy industry.

Charles Sedwick Matthews was born in Houston, Texas, on March 27, 1920, to James and Zadoc Sedwick Matthews. An early achiever, he received a scholarship to Rice in 1937, and there he was an outstanding scholar (all As) in chemistry and chemical engineering, with a B.S. in 1941, an M.S. in 1943, and a Ph.D. in 1944. After graduation, he joined Shell Development Company in San Francisco, California, and began his career by applying his academic studies of the thermodynamic properties of hydrocarbon gases to the design of refineries and chemical plants.

In 1948, he returned to Houston, where he became one of the ‘connate staff’ at Shell’s new Exploration and Production Laboratory in Bellaire, Texas. Although educated as a chemical

engineer/chemist, Matthews easily adapted to the Physical Research Department where physicists were just beginning to do experimental reservoir engineering studies. He applied his knowledge of light hydrocarbon fluids to PVT (pressure-volume-temperature) studies of gas-condensate reservoirs. These studies enabled reservoir engineers to predict behavior, and to operate gas-condensate fields more efficiently.

In the early 1950s, there was a need to understand the macroscopic flow of fluids in oil reservoirs, especially in water flood pilots, where only a few wells were used to determine the feasibility of large-scale projects. Experimental physical models of arrays of wells in fields showed that unexpected migration of oil often occurred during flooding operations. The 19th century 'law of capture' allowed operators to produce oil across neighboring lease lines. This resulted in the wasteful practice of drilling extra wells on close spacing. In the famous Yates Field case, Matthews used model studies to demonstrate to the Texas Railroad commission the need for new laws requiring the unitization of the fields. Unitization allowed fields to be developed with fewer wells and with an equitable sharing of oil reserves. The reserves were based on the geological/petrophysical derived volumes of each owner, rather than on the number of wells or their productivity. In other studies of fluid injection, he examined the effects of gravity drainage on flow patterns.

In 1952, Matthews began his most notable work on developing an understanding of, and methods for, analyzing transient pressure behavior in oil and gas wells. During the next 10 years, pressure transient analysis became Shell's most important tool for observing the behavior of reservoirs. Publication of the first Society of Petroleum Engineers, SPE Monograph, "Pressure Build-up Analysis and Flow Tests in Wells," gained international recognition for Matthews and his co-author, D. G. (Don) Russell.

In 1956, Matthews was chosen to succeed A. F. (Tony) van Everdingen, as Supervisor of Reservoir Engineering Research, and nominally, Shell's Chief Reservoir Engineer. In those years, he provided individual technical guidance for a large group of

engineers and scientists and wrote company reports on a variety of reservoir engineering subjects, including relative permeability, pressure build-up, sweep efficiency, and material balance. He also played a major role in establishing Shell's leadership in thermal oil recovery, chemical surfactant flooding, miscible hydrocarbon flooding and carbon dioxide flooding. Initial piloting of these processes often encountered difficulties. Even when things weren't going very well, we never heard a cross word from him. Without his strong research leadership, those processes would have been abandoned and many of the later successes would not have occurred. The success of steam flooding alone has yielded several billion barrels of oil production world wide. Matthews proposed the industry's first CO₂ flood to the Texas Railroad Commission, and his earlier work on miscible flooding contributed to the commercialization of that process.

In spite of the incredible intensity of those years, Dr. Matthews had an easy manner that instilled an atmosphere of understanding and tolerance; however, we all knew it was unwise to go into his office with a weakness in a technical argument. He would surely ferret it out and let you know. He led our group by the technical respect that we all had for him.

In 1965 he assumed greater management responsibilities, successively as Shell's Manager of Petroleum Engineering-Head Office, Director of Production Research, and Shell Oil Engineering Manager. In these positions, he guided the careers of hundreds of young engineers and promoted the very successful concept of a parallel respect in the organization for technical careers as well as for management careers.

In the later years, he became the Senior Petroleum Engineering Consultant, and in that capacity was a highly valued advisor to Shell's top executives. He also became an articulate spokesman for the development of energy policy in the United States. As an early proponent of geothermal energy, uranium (yellow cake) exploration, and tar extraction and upgrading, he was regularly invited to give expert testimony before congressional committees and regulatory and judicial bodies.

In his long career, Dr. Matthews accumulated a long list of honorary memberships, including an unusual combination of scientific and engineering societies: Phi Beta Kappa, Sigma Xi, Tau Beta Pi, and Phi Lambda Upsilon.

He was also honored by the Society of Petroleum Engineers as the recipient of the 1982 Lester C. Uren award for distinguished achievement in the technology of petroleum engineering, an SPE Distinguished Member, a Distinguished Lecturer, a Distinguished Lecturer Emeritus, and a Distinguished Author.

He served on many committees and consulting bodies, including the Department of Energy (DOE) – Fossil Energy Board; Consultant to the DOE; National Petroleum Council (NPC) – Special Assistant on major studies of Enhanced Oil Recovery (EOR) and Unconventional Gas; American Petroleum Institute (API) – Chairman, Reserves Advisory Committee; Interstate Oil Compact Commission (IOCC) – Advisory Committee Tar Sands and Heavy Oil Deposits; Rice University – Engineering Advisory Council; and Chairman, Texas Engineers for Conservation.

In 1985 he was elected to the National Academy of Engineering “for distinguished contributions to petroleum engineering technology and to development of public energy policy in the United States of America.”

From Dr. Charles Matthews, the superachieving engineer/scientist, let’s now turn to the Charlie Matthews we knew. There are many stories of his flair for living. Always a careful dresser, he often came to work with a boutonniere rose in his lapel, and sometimes brought bouquets of roses for the secretaries. His light-hearted introductory comments became a tradition at our quarterly research meetings with Shell Canada and helped build teamwork in these intense technical sessions. After studying Mandarin for a few months, he delivered his keynote address in Chinese at the World Petroleum Congress in Beijing in 1987. In his obituary, he was described as, “. . . a happy man with a delightful sense of humor. He was a very accomplished yet humble man. Above all, he was a devoted husband.” That nicely describes him. He met his wife, Miriam (Rice) in 1944, when

they were in school. They were married for 63 years and have two daughters, Joan and Wendy. When Charlie worked in New York, he wrote parts of the famous SPE Monograph while commuting on the train. Miriam reviewed and typed his notes. Charlie said, "It was much better received than my wife predicted — being an English major, she didn't care much for the plot."

Charlie was variously described by his associates as "... a man of high intellect, humor, and humanity," "... a good friend and mentor over many years," and "... a kind, able and talented man!" I consider it a great honor to have worked for him, and to have co-authored my first AIME-SPE paper with him. I was just a summer employee, but he let me make the presentation at the SPE Fall Meeting, and put my name before his on the paper. Charlie was one fine Gentleman!