

## **THE PAST 100 YEARS - WHAT HAVE WE LEARNED**

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The oil industry has progressed and evolved over the past 100 years. This paper will provide an overview of these changes and the lessons we can learn from them. Several case studies will be discussed, and we will take a look at “then” and “now” in the world of oil.

## **AFTER DRAKE: PEOPLE, PLACES, AND PETROLEUM**

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Drake completed his successful oil well in August 1859. By the end of that first historic year, at least 5 additional oil fields had been discovered by other new drillers, and were producing oil in Pennsylvania. By the close of the 19<sup>th</sup> century, nearly 300 oil and gas fields were in production. A series of maps highlight annual field discoveries as we follow the trend of exploration, discovery, and development of petroleum in Pennsylvania's oil and gas producing region. Our tour slices through history starting in 1859, and we will pause occasionally to consider some of the influences on the fledgling petroleum industry. Careers and character of some entrepreneurs nudged the known limits of the oil region outward, while new uses for oil and gas helped to assure new markets. Solving problems at the well site required inventions and innovations in hardware that pressed machine shops to improvise. The young petroleum industry played a role in the War Between the States and the reconstruction that followed. We will focus on some of the less well-known oil and gas fields and the visionaries whose inspiration and determination led to successes in regions of Pennsylvania sometimes far from the Oil Creek Valley.

## **PETROLEUM GEOLOGY HERITAGE AT RENSSELAER**

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In the 19<sup>th</sup> century Rensselaer geologists, especially Amos Eaton (1776-1842), Ebenezer Emmons (1800-1863), and James Hall (1811-1898) developed the stratigraphic framework of New York State geology which became the key to the Paleozoic and Mesozoic geology of North America. In fact, Amos Eaton discovered local gas and named the locality Gasport.

By 1948-1950 Rensselaer realized the prospect of the fuel problems and started a program known as Fuel Resources, headed by Roland F. Beers (1899- ?). Beers specialty included geophysics, especially seismic and acoustics, radioactivity, exploration for petroleum, and geological aspects of electromagnetic wave propagation on the ground. Following Beers,

Shepard W. Lowman (1899-1967), a former Chief Research Geologist of the Shell Oil Company headed this program. In 1952 this program listed six staff members. The options for specialization were in (1) petroleum geology, (2) petroleum geophysics, and (3) geological engineering, subjects which are the most sought after specialties among the sciences even today.

The choice of Lowman as head of this program was remarkable indeed. To explain this I must briefly digress. Despite an August history of 150 years, sedimentology as a science advanced most rapidly within the last few years. This rapid advance resulted from a change of sedimentology as a pure to an applied science. Whereas previously used techniques in oil and gas exploration consisted solely of a search for closed subsurface anticlines, known as structural traps, emphasis shifted to exploration for subsurface stratigraphic traps in which porous and permeable sedimentary rocks are in lateral stratigraphic contact with impermeable sedimentary rocks. Such lateral contacts of different and distinct sedimentary rocks reflect differences in depositional conditions and hence two or more contiguous paleoenvironments. Such recognition of the enormous value of sedimentology as a key to the discovery of stratigraphic traps represented a turning point in the history of the science.

Beginning with this recognition in the late 1940s and early 1950's, the first large-scale research projects materialized. The 1947 Report of the Research Committee of the American Association of Petroleum Geologists, under the leadership of Shepard W. Lowman, stated that research in sedimentology is the most-urgent need in petroleum geology. Project 51 of the American Petroleum Institute, established by Lowman, led to a methodical and detailed study of modern depositional environments on a scale not previously attempted. Much of the background of this largest-of-all projects of the American Petroleum Institute was prepared by Lowman, who first conceived the idea. A classic book emerged from this team effort published as a special volume by the American Association of Petroleum Geologists.

## **ORGANIC METAMORPHISM IN PENNSYLVANIA, 1863; HENRY DARWIN ROGERS AND THE ORIGIN OF PETROLEUM.**

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The May number of *Good Words* magazine in 1863 carried an article on coal and petroleum by Henry D. Rogers, Regius Professor of Natural History in the University of Glasgow. In it he expounded new ideas on the genesis of petroleum, saying that it arose from the thermal alteration of organic matter in deep source beds, and migrated upward into reservoirs. A century passed before the heavy hand of science acknowledged the truth of his observations.

Henry Darwin Rogers was born in 1808 at Philadelphia, Pennsylvania. By the age of twenty-three he was an accomplished journalist and teacher of science. In the summer of 1832, together with two friends, sons of the social reformer Robert Owen, he sailed for London, where he proposed to engage himself in educational activities among the poor, and to learn the latest in scientific development. He attended some lectures at the new University of London, joined the Geological Society, and took part in early work of the nascent Geological Survey [England].

Rogers returned to America in 1833, determined to improve the state of geological science in the United States. Three years later he became Director of the First Geological Survey of Pennsylvania. A study of coal analyses soon made him aware of progressive westward gain in