

square miles dotted with scores of working oil wells located just outside of town. After oil was first discovered in the area in 1860, it took 20 years to hit *the big one* in 1881. Then it was like the gold rush all over again. But the boom didn't last and by 1920 only a few wells were left.

*Lighting the Frontier* captures the legacy left by the early pioneers of the Colorado oil industry through photographs, interviews, re-enactments, and footage of the field as it looks today. It explains the geologic factors contributing to the formation of this important field in layman's terms, and highlights Colorado's numerous other natural resources, including coal, gold, and dinosaur fossils. This video documents the important role Florence Field played in establishing Colorado as a significant oil and gas producing state.

This video was produced by the Rocky Mountain Association of Geologists.

#### **HENRY DARWIN ROGERS (1808-1866): ORGANIC METAMORPHISM IN PENNSYLVANIA AND THE ORIGIN OF PETROLEUM, 1863**

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Henry Darwin Rogers, a young social reformer from Philadelphia, took ship for England in 1832. Somewhat unexpectedly he found himself welcomed into the world of geology, where his astute mind and ready adaptation to metropolitan ways enabled him to absorb and retain an incomparable grounding in the new science given by Edward Turner, Roderick Murchison and Henry de la Beche.

On returning to America, Rogers began research on the constituents of coal. In 1835 he was appointed Director of the first Geological Survey of Pennsylvania, and soon perceived from analyses of coals in the State that their volatile content varied from place to place, rising in an orderly way from southeast to northwest.

When, in 1859, drilling for petroleum began at Titusville, Rogers initially believed the rock-oil to be a product of devolatilized coal, though he soon abandoned that view when oil was found in quantity outside the coal-bearing districts. Convinced by proof of graded metamorphism among coals, Rogers leapt to the realisation that a similar gradient was present in organic-rich strata below the coal, naming Devonian Genesee and Marcellus shales, and Ordovician Utica shale as petroleum sources.

Rogers's findings were published in 1863 by *Good Words*, an English journal unknown to science. There they lay unremarked for 67 years, until noticed in 1930 by J. V.

Howell and the American Association of Petroleum Geologists. But they were again ignored, and a further 40 years passed before the oil industry brought itself to understand what had been said in 1863.

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

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In May 1863, *Good Words* carried an article on coal and petroleum by Henry D. Rogers, Professor of Natural History in the University of Glasgow. It expounded new ideas on the genesis of petroleum- that it arose by thermal diagenesis of organic matter in source beds and migrated upward into reservoirs. A century passed before the heavy hand of oil industry science indicated that Professor Rogers had been right.

Henry Darwin Rogers was born in Philadelphia. By the age of twenty three he was an accomplished lecturer and an Owenite reformer. In the summer of 1832, he sailed for London to study science and social reform. He attended lectures on science and was welcomed into geology, not least by Henry de la Beche, founder of the Geological Society in Britain. Three years after his return, Rogers made Director of the Geological Survey of Pennsylvania.

Analyses of coal quickly made him aware of a progressive westward gain in volatile content across the Alleghenies. He thought that petroleum came from metamorphosed coal, but his knowledge of the coal told him that the newer oilfields were outside the coal district. He realized that other carbonaceous beds were the oil source, and identified them as thermally altered shales of Devonian and Ordovician age.

#### **THE PREHISTORY OF SUBSURFACE EXPLORATION, 1533-1799. ORDER, THE GREAT CHIME AND SYMPHONY OF NATURE**

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Practical stratigraphy long preceded any scientific theory of geology, it was always distinct from cosmogony or weird fancies of the earth. Exploration for a mineral commodity required skills learned on the ground, chiefly to balance economic worth against working hazards.

Experience with coal, iron ore, and quarried stone taught the facts of lithology, bed thickness, facies variation, and structural attitude. Genuine stratigraphy was always a dual activity of measuring strata and observing their natural order.