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 subsurfaces anticlines, known as structural traps, emphasis shifted to exploration for subsurface stratigraphic traps in which porous and permeable sedimentary rocks are in laterial 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 cal 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

their volatile content. He thought petroleum might have originated from de-bituminized coals, but his knowledge of coal distribution in relation to the oilfields told him otherwise. He saw that carbonaceous beds other than coal were the source, identifying them as thermally altered shales of "the lower-seated Silurian and Devonian deposits almost exclusively."

ORIGIN OF PETROLEUM IN PENNSYLVANIA, 1863

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Henry D. Rogers, Director of the First Geological Survey of Pennsylvania, noted in 1841 that there was a progressive decrease across the State in the volatile content of coals. He perceived that debituminization of anthracite had been caused by a process of thermal metamorphism, and that the volatiles driven off might have formed petroleum. In 1863, three years after the Drake well, as oilfields began to appear outside the coalfield areas, he pointed conclusively to deeper sources, naming bituminous shales of the Genessee, Marcellus, and Utica formations as the petroleum source. A hundred years later, oil-company geologists re-invented Rogers' ideas, treating them as new and confidential information.

SUBSURFACE DENSITY LOGGING - 1712

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Measuring rock densities in a subsurface environment could be presented, if it were true, as an oil-industry innovation. In fact, density logging of subsurface strata dates from the 18th century. In 1712 two members of the Royal Society published lithologic data, bed-thicknesses, and rock-densities found in a sequence of strata penetrated by a coal mine at Dudley, England. They measured the specific gravity of samples from each stratum, and made a stratigraphic table of the results. All their measurements accord with bulk-densities used for present-day well-logging. This unique work totally destroyed John Woodward's famous and popular *Theory of the Earth* (1695).