

## Historical Highlights



# The Birth of the Modern Oil Industry in the Northern Carpathians

Various practical applications of oil, gas and other forms of hydrocarbons have been known in different countries and on different continents for centuries. The modern oil industry, however, with oil and gas being used as an effective and economically viable source of energy, began relatively recently, in the mid-19th century, with the discovery of an effective refining process to transform crude oil into lamp oil and the invention of safe and effective oil lamps. These early developments, plus the increased demand for oil (and then gas) by the energy sector, were quickly followed by rapid advances in drilling technologies, petroleum geology, geochemistry and geophysics.

As is very often the case in other areas of invention, the birth of the modern oil industry is also a good example of the so-called “parallel thinking,” i.e. of developments or discoveries that were independently achieved at approximately the same time by various people in different places. By the early 19th century, the required critical mass of knowledge and experience had been reached that – coupled with an increasing demand for hydrocarbons – allowed for the rapid advance of oil and gas exploration and production technologies.

The first documented well drilled to produce petroleum, the Bib-Eybat well, was spudded in Baku region (then part of Russia) in 1848. The best known name associated with the birth of the modern oil industry, however, is “colonel” Edwin Drake, who in 1859 drilled his famous well in the Oil Creek Valley in Pennsylvania that led to the first oil boom in the United States.

Simultaneously, oil prospectors were equally busy in the Carpathians. The northern segment of this orogenic belt, presently located in southeast Poland and western Ukraine, belonged in the late 19th and early 20th century to the most prolific hydrocarbon provinces and, for a short period of time, was the third-largest oil-producing region in the world. Oil and gas fields are located within the Outer Carpathian thrust sheets, predominantly composed of Cretaceous-Paleogene deepwater turbidites. Fine-grained clastics, rich in organic matter, form excellent source rocks, and coarse-grained sandstones form good-quality reservoirs. Surface hydrocarbon

occurrences (oil seeps and gas exhalations) have been known in the Outer Carpathians for centuries, with earliest published records dating back to the 16th century.

Full-scale commercial mining operations began in the mid-19th century. They first focused on oil, and later also on ozokerite (earth wax) and natural gas. It came about because of the hard work and persistence of Polish pioneer Ignacy Łukasiewicz and his vision of the future industrial development of his home country.

### Early Life

Łukasiewicz, together with Edwin Drake and other mid-19th century figures, can be regarded as one of the founders of the world's modern petroleum industry. His life was intimately linked to the complex history of Poland in the 19th century, which until 1918 did not exist as an independent country after being partitioned in the late 18th century among Russia, Prussia and Austria.

He was born in 1822 near the city of Mielec in southern Poland. His father, a member of the local nobility, participated

in the 1794 Kościuszko Uprising – one of numerous efforts to resurrect independent Poland. After completing his basic education, Łukasiewicz began his professional career as a pharmaceutical assistant, first in Łańcut, and later in Rzeszów.

During this period of his life, Łukasiewicz developed a keen interest in chemistry that determined his future professional activities. His time in Łańcut and in Rzeszów also shaped his political profile: he became involved in various patriotic activities under the guidance of Edward Dembowski, one of the leaders of the unsuccessful 1846 Kraków Uprising, and was arrested and imprisoned. He was released after 18 months in prison in Lwów, in the western Ukraine. He always remained a suspicious figure in the eyes of Austrian officials, though.

The next and probably most important step in his career was his employment at the “Under the Golden Star” pharmacy in Lwów. His professional achievements as a self-educated chemist prompted local authorities to give him permission to enroll for graduate studies in chemistry and pharmacy at the Jagiellonian University in Kraków. After moving

to Vienna in the final years of his studies, Łukasiewicz graduated in 1852 from the university there. Quite possibly in Vienna – then the grandiose capital of one of the world's largest empires – he was acquainted with the latest information on the practical use of oil and the growing interest in oil deposits.

### Łukasiewicz the Oil Pioneer

Upon his return to Lwów, apart from continuing his duties at the “Under the Golden Star” pharmacy, he embarked on another path of his career that focused on practical applications of petroleum. In parallel with Abraham Gesner, who developed a process to refine a liquid fuel – kerosene – from coal, bitumen and oil shale, Łukasiewicz, together with his co-worker and business partner Jan Zeh, developed an effective distillation process of kerosene from crude oil. Then, together with Adam Bratkowski, a local tinsmith from Lwów, he designed an effective and safe kerosene lamp. On July 31, 1853, their lamp was first used in a local hospital in Lwów to illuminate

Continued on next page ►





**A.** Map of oil-bearing areas in Galicia” published by R. Zuber in 1897. Blue: oil fields associated with Cretaceous reservoirs, red: oil fields associated with Eocene reservoirs, violet: oil fields associated with Oligocene reservoirs, green: oil fields associated with Miocene reservoirs. Inset marked in yellow shows location of Bóbrka and associated oil fields, where I. Łukasiewicz established his first oil mine. **B.** Geological Atlas of Galicia, Grybów-Gorlice sheet by Szajnocha (1896a) - part showing vicinity of Gorlice – Libusza, where Łukasiewicz conducted his first activities. **C.** Geological Atlas of Galicia, Jasło-Dukla sheet by Szajnocha (1896b) - part showing location of the Bóbrka oil field.

◀ Continued from previous page

an emergency surgical operation.

In 1854 Łukasiewicz moved to Gorlice in southern Poland, located in a part of the Carpathians well-known for its oil seeps. That year also, together with his business partners Tytus Trzeciecki and Karol Klobassa, he established an oil mine in Bóbrka near Gorlice. This mine first deployed hand-dug oil wells, then wells drilled using manually operated percussion-type drill bit on rods and a free-fall drilling apparatus, and finally cable-tool drilling, powered by a steam engine since

1872. All those technical achievements place the Bóbrka oil mine, the brainchild of Ignacy Łukasiewicz and a result of his perseverance and hard work, amongst the first modern producing oil fields in the world. It can be still admired by enthusiasts of oil industry history at the Bóbrka Museum of Oil and Gas Industry – a true “must-see” for any petroleum geologist.

The establishment of the commercially successful Bóbrka field marks the beginning of the pioneering phase of the development of the modern oil industry in the Northern Carpathians. Later, numerous other oil

fields were put on production in the western Carpathian oil district, such as Siary, Sękowa, Męcina Wielka, Kłęczany, etc. Łukasiewicz had business interests in many of those ventures and he was also instrumental in beginning refineries in Ulaszowice, Siary, Kłęczany, Polanka and Chorkówka – all located in the northern Carpathians.

The second phase of development of the modern oil industry in the Northern Carpathians is associated with the development of oil fields in Borysław region, currently in western Ukraine. This rapid oil industry development, triggered

by Łukasiewicz’s pioneering activities, also included production of natural gas and ozokerite.

Very soon it was realized in Poland that effective oil and gas prospecting required not only luck and business persistence but also professional service: geological, drilling and others. The search for hydrocarbons in the northern Carpathians led, for example, to the development of modern micropaleontology some 20 years before it was used in the U.S. Gulf Coast region. Also, an extensive mapping

See Professional Service, page 25 ▶



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**Piotr Krzywiec** holds a master's in geology and a master's and a doctorate in exploration geophysics. He studied at the Jagiellonian University and the AGH University of Science and Technology, both in Kraków, Poland, and at Imperial College in London. Having spent 16 years at the Polish Geological Institute in Warsaw, in 2012 he joined the Institute of Geological Sciences of the Polish Academy of Sciences in Warsaw, where he holds the position of associate professor. He has also been an external lecturer in geophysics/seismic

methods at the Jagiellonian University, Kraków, and at the Adam Mickiewicz University in Poznań. His main research interests include integrated analysis of geophysical and geologic data, application of geophysical methods in exploration for conventional and unconventional hydrocarbons, and the history of geology. He has authored or co-authored more than 300 conference abstracts, papers or book chapters published in Poland and abroad. He is an AAPG Member, a member of the Polish Geological Society, Society of Exploration Geophysicists, the Petroleum History Institute, the International Commission on the History of Geological Sciences, of the History of Earth Sciences Society, and the History of Geology Group of the Geological Society of London.

## Professional Service from page 21

program was established in a form of the Geological Atlas of Galicia, consisting of 99 high quality geological maps at a scale 1:75 000, published between 1875 and 1912 and covering almost the entire northern Carpathians and their foreland.

Łukasiewicz certainly had a far-reaching vision regarding development of the oil industry that, in his opinion, might have fueled economic development of Galicia, then one of the poorest provinces of the Austrian Empire. Apart from his own successful business ventures, he was instrumental in organizing other professional activities as he clearly saw a need for the exchange of ideas and opinions among professionals involved in exploration and production of oil, gas and ozokerite. In 1877 – i.e. 30 years before the AAPG was established – Łukasiewicz coorganized the first Oil Industry Congress, during which the decision was made to establish the National Oil Society ("Krajowe Towarzystwo Naftowe"), one of the world's first oil industry professional societies. The society ceased to exist in September 1939, at the onset of World War II.

### Łukasiewicz the Philanthropist and Statesman

Despite being very busy with his professional life, Łukasiewicz never abandoned his patriotic activities. After the January Uprising in 1863 he supported participants and victims of this and other attempts to set Poland free from its occupants. His charity work was also significant and important, with numerous local establishments such as public gardens, schools, hospitals, local roads, etc., being co-funded from his own resources. In 1873, in recognition of his numerous charitable activities, Pope Pius IX awarded him the title of Papal Chamberlain and the order of St. Gregory the Great.

Ignacy Łukasiewicz died, a rich man, on Jan. 7, 1882. He was buried in Zręcin, a small village located not far from Chorkówka, where one of his best-known refineries was located. He remains well known in Poland and many schools and streets in cities and villages, especially in the Carpathian region, bear his name. He also deserves to be remembered by the world's oil industry as one of its pioneers and founders. [E](#)

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direct application of the oil industry fieldwork, saying it was better than using (lithologic) logs. He also mentioned that he had not been able to distinguish the K-T boundary with this technique.

While one prominent petroleum geologist, Henryk Walter, Polish counsellor for Mining Affairs, immediately embraced the utility of Grzybowski's techniques, another petroleum geologist, Rudolf Zuber, who was the leading Polish petroleum geologist at the time and author of "Oil and Flysch," was perhaps threatened by this young upstart and chose to ridicule his work, calling it "pointless" and essentially only "fooling around with foraminifera." Though Grzybowski defended his ideas and discovery very succinctly, Zuber's discouraging words took hold. Even in 1970 when Peter Webb, a New Zealand micropaleontologist, was writing about Grzybowski, he noted that Zuber's remarks still tainted the reputation of Grzybowski's foraminifera work.

Meanwhile, Grzybowski went on to other prolific research and work as a scientist and publisher in a great number of aspects of geology from tectonics and geologic mapping of Galicia to writing a drilling manual; but never again did he attempt to publish about and encourage the use of foraminifera for correlations.

Later, he had students who became excellent paleontologists, mostly with

larger forams like nummulites, but his "discovery" was lost to the world of applied micropaleontology. Grzybowski died in 1922 just before the work of the three women in Houston was published in 1923 (the initial breakthrough was presented orally in 1920, more fully in 1922).

The independent discovery of the value of foraminiferal assemblages for correlations and as a substantial contribution to the economics of oil and gas exploration by Alva Ellisor, Esther Applin and Hedwig Kniker in Houston met with a different fate. The utility was immediately recognized and embraced by some of the most respected oil and gas geologists of the time and quickly revolutionized the industry. The women had their antagonist – their own "Zuber" – in the personage of Jessie Galloway, but he was quickly converted to a believer and was soon consulting for oil companies using their technology. It was not until almost 20 years later that their discovery was minimized and credit diverted to their male colleagues.

Even after industry embraced foraminiferal biostratigraphy, Polish geologists did not begin to appreciate Grzybowski's groundbreaking work until 1943 when Heinrich Hilterman of Hannover, Germany, confirmed the utility of his work. Not until 1967 did work begin cataloguing and appreciating the abundant collections of Grzybowski.

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