

MORE OIL
C. L. Moody¹

On this, the occasion of the third annual meeting of the Gulf Coast Association of Geological Societies, it seems worthwhile to explore briefly and seek answers to such questions as who we are, how we started and whither we go.

This organization arose and grew from general recognition that annual meetings dealing primarily with problems of interest to Coastal Plain geologists might be expected to serve professionally the workers, great and small, who are devoting their careers to this mighty province. The success of the Biloxi meetings of earlier years inspired certain stalwarts of New Orleans, Shreveport and Jackson, three or more years ago, to perfect a loosely knit but effective union of existing geological societies designed to effect continuity of regional meetings.

New Orleans was host for the first gathering of the new group. That city, famed for hospitality, was traditionally responsive. A splendid technical program was presented which revealed genuine interest on the parts of both speakers and audience. Some of the entertainment provided was also... revealing.

Last year the Association's meeting at Corpus Christi was well attended, well managed and altogether successful. Preprinting in bulletin form the technical papers orally delivered, a feature introduced at New Orleans, was adopted, and seems likely to continue as a hallmark of the Association.

Shreveport is honored with the opportunity of entertaining what is coming to be known as a traditionally successful convention. After looking through the program, hearing our mayor speak, and viewing the scene from where I stand, it is apparent to me that the Gulf Coast Association of Geological Societies is now entering upon its third successful venture.

Relations between the American Association of Petroleum Geologists and the new Gulf Coast Association have been friendly and sympathetically understanding. I see no reason, from my own experience with both groups, for doubting that those conditions will prevail down through the years to come and that the mutual benefits to be derived from cooperation will bring the two ever closer together. Both seek the same results; one general, the other specific. Both have the same objective, namely, promotion of the professional welfare of petroleum geologists. Whether this community of purpose results in merging with the national association as a section of AAPG, or in joining with the 36 other affiliates as autonomous supporters of AAPG, or in pursuing organizational independence, ... certain it is that in the hearts and minds of the membership exist faith and hope ... faith in

¹ Ohio Oil Co. President of the A.A.P.G. during 1950

the rightness of thinking which brought the Gulf Coast Association into being. . . . hope that, through whatever course is adopted, strength will be found that will insure perpetuity. Of paramount importance to all is the continuance of yearly technical meetings devoted to Gulf Coast geology. Organizational and administrative problems, weighty though they be, are strictly ancillary to this devoutly desired consummation.

Considerable satisfaction to me, as to all of you here assembled, ensues from even a cursory glance at the position which the Gulf Coast region has attained in the American petroleum industry since Captain Lucas' rendezvous with destiny at Spindletop. Here, now, is a prospective area of over 367,000 square miles where profitable production may yet be successfully sought despite the fact that over 14 billion barrels of oil have been produced from its thousands of pools. More than 11 billion barrels of reserve, or around a third of the nation's known underground supply, are blocked out within its boundaries. Twenty of the nation's 85 bonanza fields are within its borders. Its daily production of nearly 2.2 million barrels is a third of the nation's petroleum output. The potentiality of the offshore portion of the Gulf province, even yet only viewed as through a glass darkly, spiritedly stirs the imagination. The advent of 20,000-foot drilling, which seems destined to become commonplace, opens up possibilities undreamed of a few years ago. . . . Mighty indeed is the Gulf Coast in the western-hemisphere's rugged petroleum economy!

Twenty-five hundred or more petroleum geologists have fallen heir to this million-cubic-mile sedimentary province. Their heritage includes vast volumes of information compiled and saved by themselves and their predecessors. Offices and warehouses are overflowing with geological materials of every description. We, who are responsible for exploration today, have at our command countless reflection-seismograph-tapes, neatly "picked" and painstakingly computed; gravity charts with prospects alphabetically appraised; electric logs with correlations marked and lithologic subdivisions labeled. Our well-data cards are up-to-date and show unfailing signs of long service. Our files are replete with reports from field geologists, district geologists, junior geologists, senior geologists, division geologists, and party chiefs of various tribe and feather. Service organization memoirs, with their perfection of design, loom over their less ornate kindred. We have bulletins, journals, pamphlets, reprints, books in numbers unlimited and everywhere maps, cross-sections and more maps. . . . some original, some swapped; some published, some unfinished scribbles. . . . but all reflecting from some facet of geologic truth. Facts, data, truths . . . are all about us. Most of us are industriously engaged in transforming this raw material into a finished product . . . knowledge . . . in which a clear perception of meanings is reached. When that knowledge becomes dynamic we attain geologic wisdom. Only the wise can exercise the good judgment essential to successful geologic prediction.

Petroleum geologists throughout the rest of this favored land are likewise thus equipped. They likewise face the same or similar problems.

Now, endowed with all this background of experience in finding, evaluating and developing oil fields, and supported by an ever-expanding fund of pertinent information, the nation's petroleum geologists last year brought their talents to bear on 6,698 wildcat wells. A record number of new fields resulted from this concentration. The exact number was 741 . . . Gratifying indeed, you say, . . . we all say! But note that nearly 89% of the geologists' exploration work gave wrong final answers. Of course everyone knows that this 11% efficiency figure applies now, and has applied for many years, to the exploratory labors of the petroleum industry in the United States. What is not so generally perceived is that the mushrooming of geologic information resulting from well drilling, geophysical surveying, and applied research, all of which are likewise themselves mushrooming, has had no visible beneficiating effect on the 11% efficiency figure. We still have to drill nine wildcat-wells to get one discovery. In the past 6 years over 3,400 new places were found where oil had not before been known to occur, . . . but it took 30,400 wildcat wells to get the job done.

But I am not here to bear out the reported statement of one of our well-known producers to the effect that geologists are pretty good at telling you what you've got . . . after you've got it!

What is at fault with our exploratory techniques? One difficulty that I fear besets us all is conscious or unconscious obeisance to what DeGolyer has called the ruling theories of the day. Earl Noble called them "prejudices" which he defined as "premature judgments based on insufficient evidence". Any of us, young or old, can cite examples.

When I first came into the South it was "known" that no oil would be found in the Woodbine sand. Was it not a source of freshwater supply for Dallas? But Mexia changed all that. And Dad Joiner of East Texas fame and fortune must have been wearing an inscrutable smile all the while. It was also "known" that no oil could be in Arkansas, because, in its landward migratory wanderings from somewhere around the Gulf seashore it had been cut off south of the Arkansas line by the Alabama Landing fault. No one seems to have thought of prospecting the Alabama Landing fault for Arkansas' portion of Coastal plain oil. Had that been done it might have been earlier realized that there is no Alabama Landing fault . . . and Constantine and Dr. Busse might have had the support of the majors in bringing in El Dorado. It took a pair of salt domes and finally Tinsley to completely silence the early dictum: "no oil east of the Mississippi River".

"But," you say, "these and many other such ridiculous ideas were harbored by the ancients; we are not so inhibited today." To this

I reply in the words of John Y. Snyder, Shreveport's greatest oil geologist of yester-year. He was fond of saying that "most of us know a lot of things that aint so". Are we all quite sure that if J. Y. were with us here today he would find no further use for his paraphrase from Mark Twain? Re-examination of our individual ruling theories . . . and we all have them . . . might prove to be a worthwhile self-discipline to be exacted before that question is affirmatively answered.

But our most serious handicap in the race for the next oil field is not the misuse of our present information. Surely, plainly and irrefutably, it is our lack of complete fundamental information and knowledge particularly that concerning the origin, evolution, migration and accumulation of hydrocarbons in the earth that hampers us and limits our success in exploration. Only as this condition is improved can we say with assurance that exploration geologic wisdom is advancing.

Geology's overwhelmingly great contribution to petroleum exploration was the early dissemination of knowledge of the observed relationship between the occurrence of oil and gas and the strike and dip of the formations in which they occur. Determination of strike and dip was, is, and surely will continue to be, the major aim in exploration. The spirit level thus took early pre-eminence as an exploratory tool and it retains that exalted but unsung position to the present day. Its importance is exceeded only by the drilling rig. The early field-geologists discovered and made good use of the principles; the paleontologists and subsurface stratigraphers contributed their specialties; the applied geophysicists, bred, born and raised as measurers of strike and dip, have exploited the effort possibly to its limit of applicability. But, as we have seen, the efficiency of strike and dip measurements in locating new oil occurrences, - refined and ramifying as they are today, - is only 11%. Would complete knowledge of the origin and migration of hydrocarbons, integrated with our very elaborate store of strike and dip measurements, improve our finding power? I am one who thinks that it may confidently be expected to do so

Perhaps we are nearer to the solution of the problem of the origin of oil than many of us realize. It is also not improbable that we are farther away from it than the most optimistic would have it appear. It was stated on high authority at the Boston meeting of the Geological Society of America last year that the origin of oil is now known, so that the major problems left for the petroleum geologist are those pertaining to migration and accumulation. Allusion of course was being made to the intriguing publications of P. V. Smith, of the Standard Oil Development Company, in which announcement was made of the discovery of hydrocarbons in Recent Sediments from the Gulf of Mexico. Their C¹⁴ (carbon-fourteen) age tests indicate that the hydrocarbons are of the age of the containing sediments.

His paper at Houston was outstanding. Extrapolation of Smith's analyses, which he made by utilizing chromatographic techniques, indicated to him that every cubic mile of Recent sediment may contain at least 13 million barrels of oil-like hydrocarbons. Each acre-foot of sediment would thus be shown to hold up to 3.8 barrels of these substances. Generalized results from the American Petroleum Institute's research project 43, studying the problem of the transference of sedimentary organic matter into petroleum, disclose, from Zobell's work at Scripps, that bacteria may contribute from .025 up to 0.12 barrels per acre-foot of this or similar oil-like substance and, from Whitehead's work at MIT it appears that radioactivity may be responsible for only as much as 2×10^{-8} grams, per million years, per gram of sediment. The latter is about .0004 barrels per acre-foot, and is thus a negligible contribution. The known processes would therefore seem to account for only 3% of the hydrocarbons now thought by many to exist in Recent sediments. But these hydrocarbons are not oil and they are not explained; nor is their transformation into oil understood, if, indeed it does occur at all. Well-trained minds are delving deeply into these subjects; definitive answers may come at any time.

To accomplish progress in better understanding of the origin of oil-pools, which would seem to be prerequisite to improving our finding power, and assuming that oil is indigeous to the sediments, it is necessary that everything possible be learned respecting the processes of sedimentation and diagenesis, that is, the origin of sedimentary rocks. This is a field that has been tilled since the time of Plato; it has regularly produced in some degree proportional to the zeal and industry of the husbandman of the day. But its fruits have not yet been brought to the perfection demanded by the modern scientific epicure. That this is so, and that perfection is now being diligently sought after, is apparent in most any research center. The large attendance at this meeting proclaims it; the membership rolls of technical societies, literally bursting at the seams, confirm it. My own interest in the search is to some extent implemented by my connection with an American Petroleum Institute Advisory Committee which is conducting a sedimentology program in the Gulf of Mexico. My committee is made up of 36 of the industry's top-flight scientists. Each of them harbors the belief that sedimentology holds the key to unopened vaults of exploration-wisdom; each of them is manfully striving to help the Project Director find that key. Progress is woefully slow, but the search goes on, here, and throughout the land. Sedimentology is now a branch of geology, but it is today assuming such importance that it may even successfully seek independent status as a science. If Stratigraphy is the foundation of geologic history, then Sedimentology is the substance from which the foundation is fabricated. Engineers, physicists, chemists, biologists, mathematicians, astronomers are all engaged in helping geologists roundout a full picture of the birth, life, death and resurrection of the sedimentary rocks. It is not too much to hope that the picture will be completed in time to inspire the sagging explorationist to a new burst of discovery thinking.

On other occasions I have quoted from a pronouncement from the National Petroleum Council setting forth a "National Oil Policy for the United States". In that contribution, handed down from the highest executive level in the industry, are these incisive words:

"Finding oil calls for the efforts of a great many people of different characteristics. Despite the development of scientific methods, a major factor in discovery is still the willingness of many individuals and competing industry units, exercising independent judgments, to take risks. The chances of finding oil are increased as more people are encouraged to accumulate and venture their capital on their own initiative."

Our principals, our patrons, our clients . . . in short, our bosses . . . say to us in this statement that they give full credence to our scientific vision but that they seek additional encouragement which will prompt them to take further risks. It is wholly unrealistic to assume that the risk-element can ever be entirely removed from exploration. Dampier in his great book, "A History of Science", assures us that "science cannot make any predictions about future happenings without an appeal to the laws of chance". This quotation confirms the common-sense conclusion that wildcatting can never be put upon a precision basis.

It is my own belief, however, that bold, relentless fundamental research on the natural history of sedimentary rocks will in time bring forth additional methods that may be successfully used in demonstrably reducing the prevailing odds of 8:1.

Meanwhile, may faith in this belief strengthen your courage to lend encouragement where encouragement is due! In that way is more oil assured.