THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

Distinguished Lecture Tour

"REMOTE SENSING IN EXPLORATION: CAN WE USE IT WHEN WE GET IT"

by

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ABSTRACT

Remote Sensing has come of age as the new descriptive term covering all aspects of reconnaissance technology from the photographic camera through thermal mapping infrared to side-looking radars. The "black-boxes" are with us in their multitude and associated with them is a bewildering array of terms, concepts and methods.

Most geologists since World War II have mastered the principles and practice of aerial photography and have developed a competency in interpretation with the successful application of these tools. In fact air photo mapping has become so common as a basis for geology that one feels lost when all that is available is a topographic map. Now that comfortable status has been removed, as practicing exploration geologists we are faced with new areas of terminology and we are struggling to become at ease in an area traditionally the realm of the physicist and electronics engineer. To compound our problem as geologists we are vitally interested in that portion of the signal which the engineers dismiss as "background". We cannot use their nice clean signals from vehicles, houses and fences. We need to see into that grey mess with the low signal-to-noise, to look for our information.

In a photograph we have sought after high resolution which has always meant spatial resolution. To some intrepid early researchers, tone value (or grey scale level) already had significance as a resolution but it was rarely set up as a specification at the time of photographing the region. We now have other resolutions which may be as important as spatial -- perhaps, like thermal resolution, to be traded for spatial resolution, as in the studies of water bodies. Grey-scale levels, signal-to-noise ratios, detector characteristics all now must be understood before geological interpretation can commence. When contracting for non-photographic imagery it is essential to understand these new tools, as the results may be markedly different to that which was intended. We fly by night with infrared sensors, and in day or night, in rain or cloud with radars. Navigation at night becomes a major problem and logistical support often a complex aspect if cooled detectors are being used.

Yet we all seem enthusiastic, eager and anxious to use it (or them) over our particular properties. We set out to find anomalies in the result-

ing imagery but often are bewildered with the plentiful supply of them we obtain. We search for the "important" anomaly in amongst those still being caused by the instruments. To interpret the data one now needs a small team of persons, each basically geologically oriented but skilled in one or other aspects of the total system - aircraft, instruments, past and present weather, soils and vegetation. Finally however it is the geological background of each of these men which is the key in deducing the lithologic and structural patterns. The new data of significance to exploration are at best mere subtle shadings, lines and trend surfaces in the greyish "background".

Remote sensing data can be used in explorations, but it must be approached scientifically. Experiments must be planned, new geographic regions must be calibrated and local geologists used in the experiments, particularly in the early stages. There is much to learn. As practicing exploration men each of us can do much to advance the basic usefulness of the techniques, if we approach them with respect and try to develop understanding. We cannot change the basic physics of the earth-air interface but we can learn how to use it to our advantage.

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Following is the Abstract of Dr. Churkin's March paper, given to the Society. It was received too late to include in the March Bulletin.

PALEOZOIC TECTONICS HISTORY OF ALASKA AND THE ORIGIN OF THE ARCTIC BASIN

By Michael Churkin, Jr.

ABSTRACT

Geological reasons coupled with geophysical data lead me to reject the continental subsidence theory for the origin of the deep Canada Basin part of the Arctic Ocean between Alaska, Siberia, and the Canadian Arctic Archipelago. Instead, the Canada Basin is a true and probably very ancient ocean basin floored by oceanic crust and rimmed by any early Paleozoic geosynclinal belt. In the Upper Devonian, uplifts in this circumarctic geosyncline accompanied by granitic intrusion produced a wedge of course clastic sediments (exogeosyncline) that spread southward into adjoining areas of Alaska, Canada, and Siberia. In both northern Alaska and in the Canadian Arctic Islands thick sequences of upper Paleozoic and younger strata were deposited unconformably on the rocks of the early Paleozoic geosyncline, showing a similarity in tectonic history between the areas.