areal extent, are cluttered with great anomalies usually regarded as "regional." These are removed in the isolation of residual features that are significant as basement and/or sedimentary effects.

A study of these deep crustal features as applied to detailed regional maps of Oklahoma reveals that (1) each such large gravity anomaly has a corresponding large magnetic anomaly and, (2) the most probable depth values calculated from selected large magnetic and gravity anomalies, assuming the same source (dense rocks rich in magnetite), show a surface, well below the crystalline masement, which has considerable relief. The relief includes pronounced lateral displacements along faults all east-west in trend. Most likely designation of this surface is the vast, world-wide Algoman surface, the USGS designation of the post-Archean surface.

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January 16, 1967

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"The Essence of the Seismic Reflection Method"

The seismic reflection method reduced to the simplest terms aims to obtain by means of observations at the surface of the earth the sonic log of the subsurface at the same location. This, in theory, can be accomplished by the generation, transmission and recovery by reflection of a delta function. Thus from observations at suitable locations one could develop in terms of the sonic log subsurface structure and stratigraphy to any desired degree of detail. Mother Earth does not permit so simple an investigation of her secrets and what is actually transmitted and received is far different and less definitive. The reflection process is discussed in some detail with observations regarding its potential and limitations.

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February 7, 1967

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"The Geological Significance of Abnormal Pressures in Oil and Gas Wells"

Oil and gas are usually found in reservoirs at pressures approximating those necessary to sustain a column of water extending to the surface. Occasionally fields are found with pressures substantially higher or lower than normal hydrostatic because the aquifer outcrops at a higher or lower elevation than that of the ground surface at the field. More often, however, abnormal pressures are found in lenticular sands with no outcrop.

Extremely high pressures, almost equaling the weight of the overburden, have been a cause of major drilling trouble on the Gulf Coast of Louisiana and Texas. It has been shown in several recent articles that adjacent to the high pressure sands the shales are undercompacted; that is, they have a higher porosity and contain more water than normal for their depth. The abnormal pressures and undercompacted shales apparently are not due to petrographic or facies changes, but rather seem to be closely associated with either thick shale wedges or with those down-to-the-basin growth faults which were active during sedimentation. The latter apparently shut off the migration of water parallel to the bedding, trapping the water in the shale.

High pressures also occur in front of overthrust mountain ranges where thrusting overloaded the shales from which the water has been unable to escape. Abnormally low pressures are rare and occur in small lenticular sand bodies which are notably devoid of edge-water. They are thought to be caused by removal of overburden, dilation of the shale, and imbibition of water.

The geological implications of these data are great. Contrary to what we have been thinking, shales are nearly impermeable to water across bedding planes, and large areas of sedimentary rocks are practically floating on water trapped in underlying shale beds. A tilt of only a few feet per mile could cause large-scale lateral sliding, and many "overthrust" mountains were probably caused by this situation. The undercompacted shale has low density, and tends to rise in shale domes or diapiric folds. When oil and gas are produced from overpressured lenticular sands water is squeezed out of the adjacent shales and this may provide a substantial improvement in the recovery mechanism.

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February 13, 1967

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"Petroleum Exploration in the Amadeus Basin, Australia"

The Amadeus Basin in Western Australia