tation of natural resources. Many statistical techniques easily can be utilized with readily available third-generation machines. Trend analysis, correlation methods, and classification procedures are used routinely to help in solving many geologic problems. As computer programs and quality data become available undoubtedly these tools will be used more and additional ones will be developed. It should be obvious that the use of computers is not expedient in all instances, but is especially applicable for manipulations which are performed many times or to unravel extremely complex situations. The potential of the computer is not yet realized, but involvement with them is creating a "new way of life" and certainly effecting change. This change is being felt in science as well as social and economic aspects of our everyday life.

Trend Analysis	Correlation Methods	Classification Procedures
2D, 3D, and 4D trend analysis	auto- and cross-correlation	matching coefficients (including similarity, correlation, distance, and cosine-theta)
harmonic analysis (includes time series, Fourier and power-spectrum analysis)	auto- and cross-association	PCA (principal component analysis), factor analysis, and cladistic methods

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December 15, 1966
WILLIAM E. HAM
Oklahoma Geological Survey, Norman
"Reefs and Stromatolites"

Sediments of limestone depositional environments are uniquely rich in the secreted skeletal carbonates of marine organisms, clearly attesting to the great importance of animal and plant life in the formation of most carbonate rocks.

By far the outstanding example of organic activity in any sedimentary environment is the construction of reefs or mounds that are built, distinctively and wholly, in response to a localized intense concentration of organisms. The structures thus built are irregular in shape and size, and are typically massive in gross appearance, lacking the stratification or bedding of the surrounding sediments. The specialized environment at the reef site is above-all characterized by a distinctive abundance of organisms, general absence of bedding, and an implied but invariable concept that the upper growth surface of the reef lies above the surrounding sediment floor. Differences in the magnitude of growth relief distinguish between reefs on the one hand and mounds or bioherms on the other. Both types are valuable in providing reservoir rocks for petroleum, but in entirely different ways.

Stromatolites likewise are manifestations of intense organic activity. They are bedded layers that consist generally of laminated carbonate sediment entrapped by blue-green algae. These layers, normally not exceeding 5 or 10 feet in thickness, are interbedded with other kinds of limestones and are a common element of many stratigraphic sequences. They are valuable as indicators of the intratidal or extremely shallow-water-marine environment, but in spite of their complete dependence upon organisms, they play no role as reservoir rocks in the entrapment of petroleum.

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January 9, 1967
JOHN P. OLSON
Standard Oil Company, Indiana
"Why Geologists Should Understand Computers"

The electronic computer is potentially one of the most powerful tools that has been presented to the geologist. In order to use this tool to supplement his experience and imagination the geologist will have to learn to understand and communicate with it.

If geologists do not learn to control the computers, they are apt to lose control of geologic exxploration. The persons directing the application of computers to geology must understand both the computer and geology, or both time and results are lost in continual translation and interpretation.

There is currently a shortage of computer programmers which is getting steadily more acute. In order to realize the potential benefits which are available with the computer, geologists will have to learn to do at least some of their own computer programming and analysis. In the process they will find that it is a lot of fun.

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January 12, 1967
PAUL L. LYONS
Sinclair Oil and Gas Company, Tulsa
"Gravity Interpretation of Major Crustal Properties"

Gravity and magnetic maps, large in

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

ROBERT KENDALL

Shell Oil Company, New Orleans, Louisiana

"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

PARKE A. DICKEY

Department of Earth Sciences, University of Tulsa

"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

DUNCAN McNAUGHTON

DeGolyer-McNaughton, Dallas, Texas

"Petroleum Exploration in the Amadeus Basin, Australia"

The Amadeus Basin in Western Australia