Several of the more than 35 exploratory wells and core holes previously drilled in the area encountered substantial oil and gas shows in the upper Miocene Fruitvale and Reserve zones. Several were cased and tested but commercial production could not be sustained. Geological review and modern well completion techniques were mutually beneficial in achieving production.

INGALLS, ARTHUR L., Conductron Corp.

Optical Methods and Equipment for Processing Geophysical Data

In recent years optical data processing has become popular for solving a number of problems. One of the biggest advantages of optical data processing is the high data rate which can be achieved. For example, a sq. in. of film may easily store as many as 1,000 elements in each of 2 directions. This gives a total of 10^6 elements per sq. in. The data may be recorded as 2-dimensional data or may be in the form of channelized data. Several operations are possible, such as spectral analysis filtering and cross correlation. The equipment for optical data processing has a high degree of versatility and stability. The versatility arises from the fact that one type of equipment may be converted to another type simply by rearrangement or addition of elements. Input and out-put equipment can be in electrical form, but more commonly is photographic in nature, the input being a transparency while the out-put is a picture.

In spectral analysis 2-dimensional data may be analyzed to obtain the power spectral density for the whole area of interest, or spectrum analysis may be obtained for a small area. This has the advantage of excluding information from the spectrum which is not of momentary interest in favor of a more precise and uncluttered spectrum of the area of interest. Such a small area may be moved in scanning fashion to search out areas of particular interest. The equations involved may be in either X, Y coordinates or R, θ coordinates, whichever lends itself to the best mathematical analysis.

LaserScan is a 2-dimensional filtering equipment in which 2 Fourier transforms are performed sequentially on the in-put transparency. The first transform produces a spectrum which may be filtered. The second produces a reconstruction of the original data after spatial filtering which permits photographing the filtered seismic section. Directional filtering may be performed to remove dips in undesirable directions, thereby improving the data of interest. Time filtering also is possible, either as band rejection with straight wires, or high-cut filters by means of knife-edge plates operating in the time direction. By this means, "ringing," or high-frequency noise, may be removed which is common to all channels.

It is also possible to perform one-dimensional spectral analysis simultaneously for many channels. For this configuration a cylindrical lens is added to the optical system to focus channels in the transparency into channels in the out-put plane. In this case, the final lens projects the Fourier transform of the data in each signal channel into a corresponding channel onto the final out-put film.

Cross-correlation also may be done by optical means. In general, this is one-dimensional, multi-channel instrument in which the recorded channels are interrogated by an expected signal. The out-put then becomes a display of the correlation functions obtained along each channel for all the channels in which the operation is taking place. In some cases it is preferable to cross-correlate filtered data. In such cases filtering and cross-correlation are performed on the same optical equipment by changing some of the optical elements. It may be that the signal function needs to be filtered. Conversely, in some cases it is desirable to cross-correlate record sections against themselves while first filtering one of the sections used as a reference function.

Various types of coded pulses can be used to obtain reference functions. These codes include *Vibroseis*, pseudo-random codes, and even dynamite shots which also can be classified as a coded impulse. It must be remembered that the coded signal may be altered for spectral content during its transit time in the earth's medium. In general, therefore, it is better to use an altered signal for the reference function than to use the initial source or code wave form. In general it is best to use coded pulses having a sharp auto-correlation function.

KILKENNY, JOHN E., and JOHN H. VAN AMRINGE, Union Oil Co. of California

Exploring the "Asphalt Jungle"

The "Asphalt Jungle" is defined herein as the urban area of the City of Los Angeles south of the Santa Monica Mountains, an area of approximately 100 sq. mi. Located in the northern part of the Los Angeles basin, this area always has been considered to have much potential but, until 1953, received very little exploration because of its location in the densely built-up part of the City.

Since 1953, advanced exploration techniques, including daylight core-hole drilling, light-charge seismic surveys on new freeway routes and on old Pacific Electric rights-of-way, and directional drilling from elaborately landscaped and carefully sound-proofed drill-sites, have yielded considerable new geological information and have resulted in the discovery of 5 new oilfields with total reserves estimated at over 100,000,000 bbls. of oil and 250,000,000 MCF of gas. Modification of City restrictions has enabled this to be accomplished with a minimum of inconvenience to the residents and financial benefit to thousands of lot owners.

The late Pleistocene and alluvial surface beds under the "Asphalt Jungle" conceal a series of sharp, locally thrust-faulted anticlines with steep to overturned southern flanks. The Las Cienegas oil field, discovered in 1960, is one of the 5 new discoveries and is on one of these nearly east-west trending features, overlying a prominent schist basement "high."

This field consists of 5 pools, P.E., 4th Avenue, Murphy, Jefferson, and Good Shepherd. The producing sandstones are encountered from 2,200 to 4,350 feet (vertical depth) in the upper Miocene (Wissler's A, B, C, D, and E Divisions), and have a maximum net thickness of 800 feet. Average daily production in December, 1964, was 10,000 BPD of 19°–40° gravity oil from 39 wells. Productive area is approximately 600 acres.

KISTLER, PHILLIP S., Bear and Kistler, consulting geologists

Procedures for Prospecting Highly Explored Areas

A highly explored area is considered to be one in which the regional structure has been defined, the regional stratigraphy is well understood, and a representative number of demonstrably closed traps have been drilled and reliably evaluated, regardless of well density or productivity.

The approach to further exploration can follow 3 routes: (1) a theoretical application of scientific knowledge to the already known geological details to determine where prospects should be; (2) working by "analogy"—finding areas where geological details resemble those of known producing areas; and (3) a "bird dog" search for details that have been overlooked or improperly interpreted that point up prospects. These approaches are interrelated.

The most important exploration methods can be summarized as surface geology, subsurface well geology, seismic survey, gravity survey, and magnetic survey. In a highly explored area surface geology, if feasible at all, is detailed and fairly complete. Gravity and magnetic surveys do not ordinarily refine an anomaly sufficiently to provide drilling prospects. Thus, the subsurface picture, growing more complete with each new well, becomes the most effective source of new prospects. Seismic survey commonly is useful in bridging the information gap between wells, especially when programmed to test a specific prospect lead.

How do discoveries result in highly explored areas?

1. Refinement of, or finding, new structural details.
2. Reinterpretation of structure.
3. Refinement of, or finding, new stratigraphic details.
4. Reinterpretation of stratigraphy.
5. Improvement of producing techniques.
6. Improvements in equipment.
7. Change in economics or management attitude.
8. "Stumbling into" an unanticipated productive situation.

Interesting examples of the foregoing include Dutch Slough; Little Sand Draw, Wyoming; Castaic Junction; Asphalto; Poso Creek; Brentwood; Lathrop; Beverly Hills; Anaheim; and Grimes.

LACOSTE, LUCIEN J. B., LaCoste and Romberg, Inc.

STABILIZED PLATFORM SHIPBOARD OR AIRBORNE GRAVITY METER

Previous LaCoste and Romberg air-sea gravity meters have been operated in gimbals, and gravity corrections have been made for the swinging of the gimbals. Because there is reason to believe that better accuracy and operation in rougher weather might be possible with a gravity meter mounted on a gyro-stabilized platform, such a model has been made.

The gyro-stabilized platform uses inertial guidance quality gyros and is accurate to about 1 minute of arc. It appeared to be entirely adequate both for laboratory tests on motion-testing machines and for tests on a ship. The gravity meter used in the first tests was one which had been used previously with a gimbal suspension, although it was known that some modifications would be desirable for operation on a stabilized platform. The overall accuracy obtained was about the same as that of the gimbal-suspended type, and it was capable of operation at about the same accelerations as the gimbal type.

In order to be able to attain the improved performance expected from a good stabilized platform, a newly constructed air-sea gravity meter was disassembled and modified as follows:

(1) It was made several times stiffer in the horizontal directions, because operation on a stabilized platform requires greater stiffness than operation in gimbals;

(2) The linearity of response of the gravity meter to vertical accelerations was greatly improved, in order that errors would be negligible at much greater accelerations.

A device for computing errors resulting from interaction between horizontal and vertical accelerations also was added. Laboratory tests on the new model are now in progress and it is hoped that ship tests will be completed in time to report the results when giving this paper.

LIAN, HAROLD M., and HENK WORIES, Union Oil Co. of California

RECENT OIL AND GAS DEVELOPMENTS IN AUSTRALIA

The past year has witnessed a breakthrough in Australian oil and gas exploration with 8 new discoveries scattered over a wide geographical area, and adding Northern Territory, South Australia, and Western Australia to the discovery list. However, the commercial potential of most of these discoveries has yet to be established.

Queensland continued active, with the most important developments being Union and Kern County Land Company's Alton discovery in the Surat basin and Phillips' deep gas discovery in Devonian strata at Gilmore. Several small, questionably commercial gas fields were found in the Surat basin and in the Bowen basin. The first Drummond basin well found oil "shows" in the Lower Permian. The Roma gas field can now supply about one-third of Brisbane's requirements.

Exoil's Mereenie field in the Amadeus basin, Northern Territory, now has 4 large gas wells producing from the Ordovician. The field has a proved length of 17 miles. Two outer wells indicate 300 feet of oil column in a tight sandstone. Reserves are indicated to be 1 trillion cubic feet.

Delhi's Gidgealpa field in South Australia has five large gas wells producing from the Permian in a 30-sq.-mi. area, with estimated reserves of 450 billion cubic feet. Another field of this size will be necessary to justify a pipeline to Adelaide.

In the Perth basin, Western Australia, Wapet's Yardarino field has two large oil and gas wells in Permian strata and two dry holes in a small fault-block trap. Wapet's Barrow Island discovery, the first success in the Exmouth Gulf since the Rough Range disappointment in 1953, has three 180–900 B/D flowing wells from thin multiple zone Cretaceous-Jurassic sandstones.

Other interesting developments include oil "shows" in two Cretaceous sandstones in the Port Campbell area, State of Victoria, oil "shows" in Cambrian dolomite and gas "shows" in Precambrian limestone in the Alice Springs area of the Amadeus basin, and "shows" in the Cambrian at Sandover in the Georgina basin. A gas "show" in Devonian was logged in the Bonaparte basin of Northwest Australia.

The year 1965 should have considerable exploration in the basins where production has been indicated, and new ventures in untested basins, including the Bass Strait where Esso is now drilling, and several other offshore areas.

LONG, J. A., United Geophysical Corp.

EXAMPLES OF OPTICAL ANALYSIS AND FILTERING OF SEISMIC RECORD SECTIONS

When coherent light from a laser beam is passed through a transparent reduction of a variable-density or variable-area record section, the seismic signals act as an optical grating to produce a diffraction pattern which is the two-dimensional Fourier transform of the section itself. By using suitable lenses, the diffraction pattern can be converted into an image of the original section. By obstructing portions of the pattern cor-