analyzed for such parameters as grain size and shape, pore volume, connectivity, and permeability.

Computer graphic displays are generated using techniques developed for biomedical applications. Colored images of the reconstructed three-dimensional pore structures are photographed from many viewing angles. These multiple views are combined by a special lens-mirror optical imaging system to produce "parallax panoramagrams" which show 20° of "rotation." Panoramagrams provide high resolution, high magnification displays which can be viewed with the naked eye, without special equipment.

State-of-the-art computer graphics, research quality optics, and new image analysis techniques have been used to provide a rigorous approach to understanding pore geometry. This novel synthesis shows particular potential for the study of hitherto intractable, complex structures.

LING, HSIN YI, Northern Illinois Univ., DeKalb, IL

Biostratigraphy and Phylogeny of Paleocene Radiolaria

In the radiolarian biostratigraphy of the Cenozoic Era, only the majority of Paleocene Epoch has hitherto remained unzoned. Submarine sediments recovered from DSDP Sites 208 and 327 of the southern ocean, contain rich and well-preserved radiolarians, thus providing an opportunity to fill this gap and to complete the radiolarian zonal scheme. The majority of forms, including some new taxa, are presented and discussed.

A rather diversified radiolarian fauna appears in early early Paleocene, but species belonging to the genus *Byryella* made their initial appearances only during the middle Paleocene. Throughout the Paleocene, numerous well-known Cenozoic forms made their first appearance. By using co-occurring microfossils for stratigraphic correlation, these initial appearances can be placed within the pre-existing planktonic zonation and geochronometric framework. The phylogeny of *Byryella* has been investigated throughout the Paleocene section.

LINK, MARTIN H., Cities Service Exploration and Production Research, Tulsa, OK

Slope and Deep-Sea Fan Facies of Miocene Castaic Formation and Lower Part of Ridge Route Formation, Ridge Basin, Southern California

The late Miocene marine Castaic Formation in Ridge basin is over 2,000 m (6,600 ft) thick and consists mostly of slope and deep-sea fan facies. The Castaic Formation is vertically transitional into the overlying Marple Canyon Sandstone Member of the Ridge Route Formation and laterally interfingers with the Violin Breccia to the southwest. The slope facies consists of poorly bedded mudstone interbedded with sandstone, conglomerate, and coquina deposits interpreted as turbidite-filled slope channels. The slope facies follows the northwest trend of the basin and occurs on the northeast, north, and southwest sides of the basin. The slope channels have laterally adjacent levee deposits. Paleocurrents in the channels are to the west-northwest and southwest-southeast, whereas paleocurrents in the levee deposits are to the northwest-southeast. Large slide blocks, slump-folded strata, and breccia beds are common in the slope facies.

Deep-sea fan deposits consist of inner and middle fan channel and interchannel facies and outer fan depositional-lobe facies. They are confined to the center of the basin, interfinger into slope facies to the southwest and northeast, and are overlain by nonmarine fan-delta complexes to the north. The channels contain thick sandstone deposits that thin and fine upward and are laterally discontinuous, whereas the adjacent interchannel deposits consist of thin-bedded sandstone and mudstone sequences which form inclined wedges of highly slump-folded strata. Depositional-lobe facies thicken and coarsen upward and consist of interbedded sandstone and mudstone which form laterally continuous deposits with minor channeling and slump folding. Paleocurrents in these deposits are to the south-southeast and suggest sediment transport down the axis of the basin from the north-northeast.

Ridge basin was a relatively shallow-marine trough about 6 km (4 mi) wide and 10 to 20 km (6 to 12 mi) long. The deep end of the basin was to the southwest and connected to the Ventura basin across the San Gabriel fault. Typical deep-sea fans did not develop in Ridge basin during Castaic Formation time; instead extensive slope deposits formed along the margins of the basin and thick but narrowly confined turbidite-filled channels and depositional lobes filled the valley or trough of this basin.

LLOYD, PETER M., Schlumberger, London, England

Reservoir Facies Zonation Using Wireline Logs

Sedimentary rocks can be described an distinguished from others not only by their lithology, geometry, sedimentary structures, and fossil content but also by their overall response on the electric logs—their "electrofacies." FACIOLOG processing zones together those sections of a lithological sequence which have a comparable suite of electric log responses to give an electrofacies zonation.

Geologists have traditionally used electric logs as a basis for zonation when drawing up composite (lithological) columns. FACIOLOG processing now offers the potential of treating all the logs, including the dipmeter, on an objective and quantitative basis. The electrofacies zonation is made by cross-plotting all the log responses on a multi-dimensional set of axes and then using cluster analysis to identify locally dense areas. Each cluster represents a series of depth intervals with a similar suite of log responses (an electrofacies). The degree of similarity of the various clusters is then expressed in the form of a dendrogram, and the complete well section is displayed with each level assigned to its own particular electrofacies.

How closely does the "electrofacies zonation" correspond to the more conventional lithofacies zonation? Generally there is good agreement because electric logs, especially with new services such as the litho-density and natural gamma ray spectrometry tools, respond to the basic mineralogy of the rock matrix as well as the fluid content. FACIOLOG processing also incorporates the high resolution information from the dipmeter, which corresponds to the basic sedimentology.

Because of the usually good match between the electrofacies zonation and the lithological zonations in cored sequences (especially in siliclastic sequences), FACIOLOG processing can be used to extrapolate the results of core analysis into those sections in the well where there is no core.

A new 22 in. (56 cm) wide presentation format allows all the logs, the dipmeter curves (with GEODIP or CLUSTER tadpoles), and the electrofacies zonation itself to be used as a basis for integrating all the information acquired when a well was drilled. Lithological descriptions from cuttings and cores or other stratigraphic information can easily be integrated onto the flexible format. Presenting all the logs together and having the additional advantage of the quantitative electrofacies zonation is clearly an aid to well-to-well correlation. With data banks, specific electrofacies zones may now be automatically traced across