councils will listen to the opinions of the entire membership and will take action that will benefit the majority.

The present Council believes that the society members generally place a high value on their relationship with the A.A.P.G., and that under the new constitution this feeling will be strengthened and extended. The Council looks forward to a new era of greater vigor in the operations of the S.E.P.M. and of a stable and satisfactory cooperation between the S.E.P.M. and the A.A.P.G. S.E.P.M.'s attitude toward the American Geological Institute is one of loyalty and enthusiastic support.

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CHENIER *versus* BARRIER, GENETIC AND STRATIGRAPHIC DISTINCTION

Barrier islands and cheniers are elongate, narrow sand bodies which may appear similar where preserved in the sedimentary record. However, their modes of origin and sequence of development are distinctive. Differentiation of these features is important in the interpretation of the depositional environments, paleogeography, and geologic history of coastal areas.

Chenier development begins with progradation by deposition of clay, silt, and sand. Rapid sedimentation precludes removal of fine material. Progradation is followed by reworking, shore retreat, and formation of a ridge at the head of the beach. Fines are transported seaward and along the shore. Sand is concentrated on the upper beach and over the adjacent marsh, and is transported along the shore, possibly accumulating in areas not actively eroding. The contact of the chenier with marsh and mud-flat deposits is disconformable beneath transgressive sand deposits, but may be intertonguing for laterally transported deposits. Increasing rates of sedimentation reinitiate mud-flat progradation and the sand ridge is left as chenier. Holocene cheniers are commonly less than 15 feet thick.

Barriers originate from a topographic ridge at the head of the beach which subsequently is partly submerged. Lagoonal-marsh sediments are deposited behind the barrier; however, continued subsidence accompanied by transgression may result in a complex intertonguing of barrier and lagoonal-marsh sediments. Barriers also form as spits and may develop seaward from a pre-existing barrier. Repeated spit formation results in the formation of sand bodies enclosed in finer sediments. Barriers, like cheniers, may be eroded, reworked, and moved landward over the adjacent marsh. Barriers predate the lagoonal-marsh sediments, whereas the sand ridge of the chenier develops on, and seaward from, existing marsh and mud-flat deposits.

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MICROFOSSILS FROM SILURIAN OF ENGLAND

This paper is one of a series dealing with world-wide correlation of Silurian beds utilizing microfossils, chiefly Foraminifera, from acid residues. Extensive collections and several publications cover many of the sequences from North America, from West Texas to the Gaspé Peninsula. To correlate these sequences with sections elsewhere, a world-wide collection of samples has been made, supported by a National Science Foundation grant. The present paper is a report on the specimens recovered from all Silurian carbonate rocks in Great Britain with which correlations are to be made from North America, Norway, Sweden, Austria, Czechoslovakia, and Australia. Preliminary examination of the specimens from the Swedish island of Gotland and Scania show that most of the species from these islands are the same as those from England. A few of the species from England, Norway, and Gotland are identical with those from the Arbuckle Mountains, Oklahoma, Kansas subsurface, and central United States, but most of them are new. Nearly all of the arenaceous Foraminifera belong to the family Saccamminidae. Most are attached forms and have brown tests with abundant iron in the cement. These forms have not been described previously. A few species of *Bathysiphon, Hyperammina,* and *Ammodiscus* are the only other genera present. More than 11,000 specimens from England and 3,000 from Gotland have been mounted, providing abundant material for morphologic, evolutionary, and taxonomic study.

In many places conodonts and scolecodonts are associated with arenaceous Foraminifera. Extensive studies and publications on these forms in Europe and North America provide a basis for stratigraphic association of all the microfossils. Such knowledge can be utilized to identify and correlate beds in places where only Foraminifera are present, thus providing an additional tool and means for correlation that previously has not existed.

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DEEP-SEA FANS IN PERMIAN DELAWARE MOUNTAIN GROUP, DELAWARE BASIN, WEST TEXAS AND NEW MEXICO

Ancient deep-sea fans, consisting of channel, overbank, and fringe deposits, are recorded in the Permian Brushy Canyon, Cherry Canyon, and Bell Canyon Formations (Guadalupian) of the Delaware basin.

Sediment economics and depositional processes that characterized the Delaware basin were very similar to those operating in modern continental borderland basins off southern California.

Margins of the Delaware basin were incised by numerous submarine canyons. During times of low-standing sea-level, concurrent with glaciation, large volumes of clastic sediment were prograded across constricted shelf lagoons, swept into heads of submarine canyons by longshore and tidal currents, and introduced into the Delaware basin through the channel-levee-over-bank system. Carbonate production and reef growth ceased on the outer platform. As sea-level rose during de-glaciation, shelf lagoons expanded and the volume of clastic sediment reaching the outer platform progressively diminished; carbonate production and reef growth resumed.

Basinward from the margin, where channels are narrow and deeply incised, channel width increases and amount of incision decreases. *Major flow units* (3–10 feet thick), restricted to deep-sea channels, commonly consist upward from the base of the following units: (a) massive, (b) large current-ripple cross-bedded sets (sand waves), (c) plane-parallel-laminated sandstone, (d) small current-ripple cross-bedded sets, and (e) plane-parallel laminae consisting of sandstone, siltstone, and shale laminae. Both large and small ripples consist predominantly of climbing

ripples (ripple drift). *Minor flow units* (less than 3 feet thick), consisting of many different combinations of massive, laminated, small current-rippled, and silty or shaly intervals, are found in channels, over-bank deposits, and as a peripheral aureole of fringe deposits.

Flow-unit thickness, velocity, and distance of travel were controlled by the volume of sediment initially released as cataclysmic avalanches and mud flows in submarine canyons.

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ASPHALT JUNGLE TODAY

The small but prolific Los Angeles basin in the state of California has experienced a resurgence of exploration activity during the past decade. Most of the onshore activity has been concentrated in a part of the basin popularly called the "Asphalt Jungle" which includes approximately 100 square miles in the urban area of the city of Los Angeles west of the Civic Center.

From 1890 to 1912, when this area was largely open country, there was active wildcatting and several important oil fields were found. Westward expansion of the city's residential section prevented further exploration for many years. Triggered by the deep-zone discovery in the Beverly Hills field in 1954, town-lot lease blocks were assembled, and Los Angeles city drilling restrictions were modified to permit daylight corehole drilling and high-angle directional development drilling from sound-proofed derricks. The result has been the development of 30,000 BOPD new production, with estimated oil reserves of 170 million barrels and 300 billion cubic feet of gas reserves from eight new oil fields. At present Las Cienegas is the largest field with a production of 15,000 BOPD, although a more recent discovery on the west may equal or surpass it.

The surface of the "Asphalt Jungle" consists of flat-lying late Pleistocene and Recent alluvial deposits which conceal sharp, asymmetrically folded, faulted, generally west-east-trending anticlines in the Pliocene, late Miocene, and older rocks. The main producing zones are in the upper Miocene alternating sandstone and shale section with a maximum net pay thickness in excess of 800 feet. Producing depths range from 2,000 to 10,000 feet, and gravity of the oil from 20° to 40°.

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GAS SHOWS LEADING INDICATOR OF PRODUCTION

(Abstract not submitted.)

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EFFECT OF NUCLEAR ENERGY ON PETROLEUM EXPLORATION

An evaluation of the characteristics of contained nuclear explosions shows attributes that may be useful in petroleum production as well as in the recovery of wealth from deposits that may be leached *in situ*, and from "thermal" areas.

The broken rock and associated fracture zone produced in the underground "pay" zone by a nuclear explosion conceivably can (1) make commercial petroleum reservoirs out of traps that are too tight to yield commercial hydrocarbon rates with currently known completion techniques, (2) allow *in situ* reporting of oil shales, and (3) aid in commercial exploitation of tar-sand deposits.

Although nuclear explosions have not been used to date in petroleum reservoirs, the data developed from several contained shots in other media can be extrapolated to yield a picture of potential nuclear stimulation "targets." In general, these are seen to be moderately deep, thick, brittle formations located in areas of low population density.

The results of a series of generalized economic analyses are presented graphically. Thus the effects of such parameters as (1) formation thickness, (2) depth of burial, (3) volume of hydrocarbon in place, and (4) device cost on the rate of return may be determined.

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COMPARISON OF DEEP-SEA CHANNEL AND INTERCHANNEL DEPOSITS OFF OREGON

Deep-sea channel and interchannel deposits from the southern part of the Cascadia abyssal plain have been studied through textural and coarse fraction analyses, fauna, radiocarbon dating, and stratigraphic sequence. Piston cores were taken along a line from the base of the continental slope off central Oregon to the western edge of the abyssal plain.

Faunal and color changes between the upper and lower sections of several cores take place abruptly in the cores. The horizon separating the upper and lower sections is a significant one (a change from glacial to post-glacial conditions). The ratio of planktonic foraminifers to radiolarians is less than one above the horizon and greater than one below. The radiocarbon age of the deposits just below the horizon is 15,200 B.P.

Both channel and interchannel sediments show a marked increase in the number and thickness of sand layers deposited during glacial time, whereas post-glacial deposits show a decrease in sand. Only post-glacial deposits have been observed in Cascadia and Astoria channels and in the interchannel area east of the latter. The coarsest layers in these channels consist of coarse silt and very fine sand, respectively. Two unnamed channels on the western side of the plain display a largely glacial section consisting chiefly of very fine sand and coarse silt. Interchannel deposits on the western edge of the plain are significantly finer-grained than those on the east.

The highest sedimentation rates in the area apparently occurred during glacial time. Radiocarbon dates indicate a rate of accumulation during glacial time of about 170 centimeters per 1,000 years for an interchannel area on the western edge of the plain. Post-glacial rates of deposition are highest on the eastern side of the plain, particularly in the area adjacent to the continental slope, and in Astoria and Cascadia channels.

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PALEONTOLOGIC CONFIRMATION OF POST-OLIGOCENE MOVEMENT ALONG SAN ANDREAS FAULT

The major fault zone of California is the San Andreas. Right-lateral displacements along this fault as great as 225 miles since late Eocene time and 175 miles since Oligocene-Miocene time have been proposed. Although post-middle Miocene displacements