GSA news & information

SUPPLEMENT TO GEOLOGY MAGAZINE

MSA Short Course on Feldspar Mineralogy to precede GSA annual meeting

The Mineralogical Society of America is sponsoring a Short Course on Feldspar Mineralogy at the Hotel Utah, Salt Lake City, October 17-19, 1975 (immediately preceding the GSA annual meeting). Lecturers will be R. A. Yund (Brown University), D. B. Stewart (U.S. Geological Survey), J. V. Smith (University of Chicago), and P. H. Ribbe (Virginia Polytechnic Institute and State University).

This short course is intended for those who desire a fundamental review of feldspar mineralogy. Topics to be included are the crystal chemistry and structures of alkali and plagioclase feldspars; lattice parameter and optical property variations as functions of composition and Al/Si order-disorder; the effects of twinning, exsolution, and other domain textures on optical properties and x-ray and electron diffraction patterns; strained feldspars; chemical features of feldspars; iridescent phenomena; subsolidus phase equilibria of plagioclase and alkali feldspars with particular attention to coherency strain (coherent solvus), exsolution mechanisms (nucleation and spinodal decomposition), kinetics of exsolution, and changes in the microstructure as a function of time and temperature.

There will be three workshops: (1) The use of x-ray powder diffractometry in lattice parameter determination. (2) The use of single crystal x-ray techniques in the study of lattice parameters, twins, and strained or exsolved phases. (3) Transmission electron microscopy applied to the study of feldspars.

Lecture notes will be distributed to participants and subsequently will be made available for sale by the Mineralogical Society of America, suite 1000 lower level, 1909 K Street, N.W., Washington, D.C. 20006.

Applications for this limited-enrollment course will be accepted upon receipt of the entire amount of the registration fee, which is $60 for MSA members, $80 for nonmembers (students: $30 and $36, respectively).

The registration fee includes short course notes and two catered lunches. Nonmembers may designate part of their fee for membership in MSA. The fee is refundable up to September 30, 1975.

APPLICATION FORM — SHORT COURSE ON FELDSPAR MINERALOGY

Name_____ Position_____

Affiliation_____

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Member of MSA?
YES ☐ NO ☐

Student?
YES ☐ NO ☐

Enclose your check for the entire registration fee and make it payable to 'MSA Short Course.' Mail this form to P. H. Ribbe, Convener, MSA Short Course, Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061.

Notice to all voting members: Change made in format of national ballot

In our constant search for ways to economize, we have changed the format of the 1975 GSA national ballot. The meeting notice and proxy (formerly printed on the flap of the return envelope) will be printed on a single sheet. The dual ballot of former days has been abandoned for a single, condensed version printed on lightweight card stock.

The former ballot numbering system has also been forsaken for a simple system requiring the member to supply his or her membership number at the top of the ballot. (This is needed for retrieval purposes at the corporate meeting should the member ask to have his or her original vote cancelled and be allowed to vote again.)

Voting procedure: (1) Mark your ballot; be sure to include your membership number. (2) Place ballot in envelope marked BALLOT and seal. (3) Tear off the proxy from the meeting notice and sign it. (4) Insert envelope marked BALLOT and signed proxy in the self-addressed return envelope.

The ballots will be mailed third class to members within the 48 conterminous states and Canada by August 15; other members will receive theirs by airmail. PLEASE EXERCISE YOUR RIGHT TO VOTE!

October deadline for Penrose Conference

A Penrose Conference on "Interpretation of Geochronology in Metamorphic Terranes" will be convened by R. David Dallmeyer at the Unicoi Conference Center, Helen, Georgia, January 4-9, 1976.

The conference will assemble workers from the fields of geochronology, metamorphic and experimental petrology, crystallography, and heat-flow geophysics. It is expected that interaction of workers in these fields will permit investigation of the various radiometric techniques and provide a better understanding of their applications and limitations in metamorphic terranes.

A registration fee of $275 will cover round-trip transportation from the Atlanta airport to the conference center, all meals, lodging, and conference expenses. Attendance will be limited to approximately 70 participants.

To apply, write to R. David Dallmeyer, Department of Geology, University of Georgia, Athens, Georgia 30602. Deadline for application is October 15, 1975.

GSA's Employment Interview Service will be available at the 1975 annual meeting in Salt Lake City. Please see p. 383 of the July issue of Geology for details.

Oil companies contribute to 1975 Penrose Research Grants Fund

The 1975 Penrose Research Grants Fund was augmented by contributions totaling $11,500 from eight oil companies: Mobil Oil Corporation, Ashland Oil, Inc., Gulf Oil Foundation, Texaco, Inc., Marathon Oil Company, Chevron Oil Field Research Company, Union Oil Company, and Shell Development Company.

Sixteen promising young earth scientists were chosen as recipients of these funds. The names of the recipients of these funds, their institutions, grant titles, and the names of the donors are as follows:

Michael Lee Batzle, Massachusetts Institute of Technology
Microfractures in the Dunes, California, and Raft River, Idaho, geothermal systems (Ashland and Gulf)

James Walter Castle, University of Illinois at Urbana-Champaign
Sedimentation in some modern Pacific trenches and comparison with an ancient example (Shell)

Jonathan Erez, Massachusetts Institute of Technology-Woods Hole Oceanographic Institution Joint Program
Influence of symbiotic algae on the isotopic composition of Foraminifera and corals (Mobil and Shell)

Albert C. Hine, University of South Carolina at Columbia
Shallow carbonate bank-margin variability: Little Bahama Bank, Bahamas (Union)

Robert Douglas Jacobi, Columbia University
Geology and geophysics of part of the terrane north and east of Lukes Arm fault, Newfoundland, and seaward geophysics (Shell)

Markes Eric Johnson, University of Chicago
Recurrent community patterns in epeiric seas: The central North American craton during the Llandovery Epoch (Lower Silurian) (Chevron)

Barbara H. Keating, University of Texas at Dallas
Construction of a continuous polarity reversal sequence for the Late Cretaceous (Mobil)

Frederick B. Keller, Yale University
Precambrian sedimentology and structural chronology of a portion of the Tennessee Blue Ridge (Ashland)

David Ronald Kobluk, McMaster University, Hamilton, Ontario, Canada
The accuracy and reliability of coral growth bands in determining coral growth rates (Mobil and Gulf)

Kyger C. Lohmann, State University of New York at Stony Brook
Carbonate shelf margin sedimentation: Platform-to-basin transition in early Late Cambrian of western Utah (Chevron)

Robert Patrick MacDaniel, University of Chicago
Upper Ordovician depositional and community patterns (Marathon)

Mark Lester Reinbold, University of Illinois at Urbana-Champaign
Stratigraphy and provenance of Upper Devonian sandstones in the Great Basin, Nevada and Utah (Chevron)

Christopher Anne Suczek, Stanford University
Sedimentology and petrology of the Harmony Formation, north-central Nevada (Texaco)

David R. Van Alstine, California Institute of Technology
Paleomagnetic determination of Late Precambrian to Early Ordovician apparent polar wandering with respect to North America with particular emphasis on Cambrian magnetostratigraphy (Marathon and Texaco)

Richard F. Yuretich, Princeton University
Sedimentology and geochemistry of a rift valley lake: Lake Rudolf, East Africa (Marathon)

Donald A. Yurewicz, University of Wisconsin, Madison
Sedimentology and paleoecology of the massive facies of the lower Capitan Limestone (Permian), Guadalupe Mountains, West Texas and New Mexico (Gulf)

[more GSA news on p. 456]

August BULLETIN briefs

Brief summaries of articles in the August 1975 GSA Bulletin *are provided on the following pages to aid members who chose the lower dues option to select* Bulletin *separates of their choice. The Document Number of each article is repeated on the coupon and mailing label in this section.*

☐ 50801—Geological criteria for evaluating seismicity. *Clarence R. Allen, Seismological Laboratory, California Institute of Technology, Pasadena, California 91125.* (17 p., 31 figs.)

The geologic record, and the late Quaternary history in particular, is a far more valuable tool in estimating seismicity and associated seismic hazard than has generally been appreciated. Those parts of the world with the longest historic records of earthquakes—some 2,000 yr for Japan and the Middle East and 3,000 yr for China—are the areas that should give us the greatest pause in using historic records for extrapolations, because earthquakes in these regions show surprisingly large long-term temporal and spatial variations. The very short historic record in North America should, therefore, be used with extreme caution in estimating possible future seismic activity. The geologic history of late Quaternary faulting is the most promising source of statistics on frequencies and locations of large shocks.

Seismotectonic relationships in California apply to other parts of the world to a greater extent than has generally been recognized. The same is true for the frequent evidence of surface faulting associated with large and small shallow earthquakes. The long history of Turkish earthquakes illustrates marked temporal changes in spatial distribution of seismicity, but all major seismic areas in Turkey could easily have been identified even in the absence of historic records by field studies of Quaternary faulting. Central Japan has so many Quaternary faults that seismic hazard must be considered relatively uniform and widespread. Abundant evidence of Quaternary and probable Holocene displacements on Median and Itoigawa-Shizuoka Tectonic Lines suggests that they are likely sources for future large events. China likewise shows close association between active faults and major earthquakes. A segment of the Philippine fault that was the locus of a recent large earthquake demonstrates that major active faults can be identified adequately in the field even in areas of tropical vegetation. Throughout the world, thrust faults present a special problem in seismic-hazard evaluation, because their configurations and degrees of activity are difficult to determine. The most important contribution to the understanding of long-term seismicity is to learn more—region by region—of the late Quaternary history of deformation. *Key words: faulting, earthquakes, seismotectonics, active faults, seismicity, seismic hazard, Holocene, Quaternary.*

☐ 50802—Pliocene climatic and glacial history of Antarctica as revealed by southeast Indian Ocean deep-sea cores. *Richard G. Blank and Stanley V. Margolis, Department of Oceanography and Hawaii Institute of Geophysics, 2525 Correa Road, University of Hawaii, Honolulu, Hawaii 96822.* (9 p., 8 figs., 2 tbls.)

Sediment and microfossils from three subantarctic deep-sea cores recovered in the southeast Indian Ocean have revealed a detailed climatic and glacial history for the Pliocene Epoch. Two cores contain sediment sequences that overlap and are of middle Matuyama through Gilbert a age, and one core extends into sediment that was deposited at the beginning of the Gilbert epoch (5.1 m.y. B.P.). Quartz grains that are >62 μm in size are found throughout the cores; the grains are of primary glacial or glacial marine origin. Other grains have features similar to grains transported mainly in a subaqueous environment. Glacially derived quartz grains become more abundant in sediment younger than the Gilbert a event; this trend continues in sediment of Gauss through middle Matuyama age. The greater abundance of ice-rafted quartz grains in sediment younger than the Gilbert a event may reflect a major late Cenozoic increase in antarctic glaciation.

Radiolarian faunas from sediment of Gauss age indicate temperatures comparable to modern surface-water temperatures at the same latitudes. Warmer water faunas, however, are found in sediment of early Matuyama and Late Gauss age, whereas cooler water faunas are found in middle Matuyama and upper Gilbert sediment. The warmest interval occurs directly below sediment of Gilbert c age. This interval is followed by a marked cooling between the Gilbert b and a events and precedes the increase in glacially derived quartz grains during the Gilbert a event. There are indications that antarctic glaciation preceded major cooling of the Southern Ocean and contributed to the long-term world-wide cooling postulated for late Cenozoic time. The marked in-

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crease in ice-rafted sediment during late Gilbert time may be related to an increase in antarctic glaciation, which resulted in greatly increased antarctic bottom-water activity in the circumpolar region. *Key words: marine geology, invertebrate paleontology, paleoclimatology, electron microscopy, sediments, radiolarians.*

☐ 50803—Markov chain analysis of computer-simulated limestone sequences. *David N. Lumsden, Department of Geology, Memphis State University, Memphis, Tennessee 38152.* (6 p., 7 figs., 1 tbl.)

In the hope of proving that the Markov property of a marine stratigraphic sequence is controlled by its position relative to basin margins, a computer-simulated sequence was generated and tested. The computer manufactures a sequence of 1,000 sedimentation units (beds), each positioned by a sea-level transgression-regression subroutine that may be systematic, random, or systematic-random. The facies-distribution pattern at each sea-level stand is controlled by the variation of five facies components (micrite, spar, fossils, coated grains, and oolite). At each of 200 points along the sea floor, the proportion of each of these components is calculated, and a facies identification number is assigned to that point. The result is a data array of 1,000 rows (beds) by 200 columns (columnar sections). Each columnar section is then analyzed for its Markov property, and a test value is computed. The test value is then plotted as a function of relative shoreline position. No relationship exists between the Markov property of a stratigraphic sequence and its position relative to basin margins. *Key words: stratigraphy, Markov chain, computer model.*

☐ 50804—North Carolina shelf-edge sandstone: Age, environment of origin, and relationship to pre-existing sea levels. *Ian G. Macintyre, Department of Paleobiology, Smithsonian Institution, Washington, D.C. 20560; Blake W. Blackwelder, U.S. Geological Survey, National Museum of Natural History, Washington, D.C. 20244; Lynton S. Land, Department of Geological Sciences, University of Texas at Austin, Austin, Texas 78712; and Robert Stuckenrath, Radiation Biology Laboratory, Smithsonian Institution, Washington, D.C. 20560.* (6 p., 3 figs., 5 tbls.)

Petrographic and geochemical characteristics and the molluscan assemblage of six sandstone samples indicate that sandstone occurring off the coast of North Carolina at the shelf break or along the shelf edge is the result of subtidal submarine lithification and did not form as intertidal beachrock. Therefore, a recently constructed sea-level curve for this area, which is based in part on radiocarbon-dated sandstone as intertidal beachrock, may contain anomalously deep data points. *Key words: sedimentary petrology, submarine lithification, Holocene sea levels, ^{14}C dating, Mollusca, carbonate geochemistry.*

☐ 50805—Coccolith sedimentation by fecal pellets: Laboratory experiments and field observations. *P. H. Roth, M. M. Mullin, and W. H. Berger, Scripps Institution of Oceanography, University of California, San Diego, California 92101.* (6 p., 3 figs.)

Copepods readily ingested coccospheres during feeding experiments. Fecal pellets contained coccoliths in a state of excellent preservation, although some mechanical breakage occurred, especially among delicate forms. Fecal pellets collected in deep waters of the eastern tropical Pacific contained mainly siliceous plankton remains but also some coccoliths showing good to moderate preservation. Some coccolith-bearing fecal matter apparently reached the sea floor, even well below the carbonate compensation depth. The implications of fecal transfer to paleontology and geochemistry may be of the greatest importance. *Key words: deep-sea sedimentation, fecal pellets, coccolith preservation.*

☐ 50806—Proportions of exposed igneous, metamorphic, and sedimentary rocks. *Harvey Blatt and Richard L. Jones, School of Geology and Geophysics, University of Oklahoma, Norman, Oklahoma 73069.* (4 p., 2 figs., 4 tbls.)

Of the rocks exposed on the Earth's surface, approximately 66 percent are sedimentary and 34 percent are crystalline. Extrusive igneous rocks average about one-fourth of all crystalline rock outcrops, with the highest percentages in Asia and South America. Less than 5 percent of all Precambrian rocks are sedimentary.

The relationship between the geologic age of a sedimentary rock and its outcrop area is lognormal and is described by a decay curve with a half-life of 130×10^6 yr. That is, one-half of all existing sedimentary rocks are younger than Jurassic. Such a short half-life indicates that the rate of sedimentary recycling must be very rapid. *Key words: sedimentology, provenance, crustal evolution.*

(continued on p. 453)

August BULLETIN briefs

(continued from p. 444)

☐ 50807—Recycled Franciscan material in Franciscan mélange west of Paso Robles, California. *Darrel S. Cowan, Department of Geological Sciences, University of Washington, Seattle, Washington 98195; and Benjamin M. Page, Department of Geology, Stanford University, Stanford, California 94305.* (7 p., 8 figs.)

The Franciscan Complex west of the Salinian block in the California Coast Ranges contains recycled Franciscan detritus. A mass of Late Cretaceous sandstone and conglomerate-breccia, the Las Tablas unit, locally contains blocky clasts of Franciscan greenstone, chert, ultramafic rocks, glaucophane-lawsonite schist, and graywacke, together with larger amounts of non-Franciscan material. The Las Tablas unit is enveloped in a Franciscan tectonic mélange, and it contains metamorphic pumpellyite, suggesting the probable onset of blueschist-facies metamorphism.

The Franciscan clasts in the Las Tablas unit represent former components of mélange related to subduction. The heterogeneous mélange accumulated as an elongate pile of "scrapings" along the inner wall of a trench. During Late Cretaceous time, submarine debris flows of Franciscan mélange material were shed from the pile into the trench, arc-trench gap, or smaller intervening basins to form the conglomerate-breccia. Eventually the Las Tablas unit was "cannibalized" by continued subduction. The unit was tectonically engulfed in a Late Cretaceous or early Tertiary neo-Franciscan mélange and was subducted to a depth sufficient to induce the development of pumpellyite. *Key words: tectonics, Franciscan, tectonic mélange, blueschist metamorphism, subduction.*

☐ 50808—Delimitation of surface weathering zones in eastern Baffin Island, northern Labrador, and Arctic Norway: A discussion. *Jack D. Ives, Institute of Arctic and Alpine Research and Department of Geography, University of Colorado, Boulder, Colorado 80302.* (5 p., 6 figs.)

The recognition by Boyer and Pheasant of three distinct weathering zones in the fiord region of southeastern Baffin Island has wide implications. Similar zones, some of which can be correlated with late Cenozoic glacial stades, have been noted in northeastern Baffin Island and northern Labrador, yet possible apparent counterparts in Arctic Norway cannot be chronologically correlated. The problem of whether or not the uppermost weathering zone indicates the persistence of ice-free areas throughout the late Cenozoic Glaciations is examined. While it is apparent that large areas remained ice free throughout the past 100,000 yr (Wisconsin equivalent), true glacial erratics, derived from a glacial episode in the much more distant past, probably exist on several high summits. Recognition of weathering zones over wide areas is a valuable tool for study of the glacial history of these regions. *Key words: weathering zones, regional distribution, glacial erratics, pseudo-erratics.*

☐ 50809—Alkali/silica distinction between Hawaiian tholeiite and alkali basalt. *Stephen E. DeLong and Mark A. Hoffman, Department of Geological Sciences, State University of New York, Albany, New York 12222.* (8 p., 6 figs., 1 tbl.)

In 1963, H. S. Yoder, Jr., suggested that the empirical dividing line between Hawaiian tholeiite and alkali basalt on an alkali/silica plot is the trace of the critical plane Di-Fo-Ab in the simple basalt tetrahedron Di-Fo-Ne-Qz. We show that the normative coordinates of the dividing line are generally similar to Hawaiian rock chemistry, but that it is not simply the projection of the whole critical plane onto such a plot. It is plausible, however, that over at least part of its length the line is the projection of the intersection of a thermal divide (on or near the join Cpx-Ol-Pl) with the boundary surface separating the Cpx and Pl primary phase volumes in the generalized normative tetrahedron Cpx-Ol-Ne-Qz. This interpretation is compatible with experimentally determined crystallization sequences of Hawaiian volcanic rocks and provides an explanation for the actual existence of the dividing line in terms of the fact that low-pressure fractionation moves liquids away from the thermal divide. This interpretation can also account for the observation that some rocks with tholeiitic mineralogy fall in the alkali basalt field of an alkali/silica plot (and conversely) as an artifact of the projection implicit in making the plot.

☐ 50810—Fenitization of Mississagi quartzite, Sudbury area, Ontario. *K. M. Siemiatkowska, Geological Branch, Ontario Division of Mines, Whitney Block, Queen's Park, Toronto, Ontario, M7A 1X3, Canada; and R. F. Martin, Department of Geological Sciences, McGill University, P.O. Box 6070, Montreal, Quebec, H3C 3G1, Canada.* (14 p., 12 figs., 6 tbls.)

Two bodies of fenitic breccia from the Kusk and Nemag Lakes area, 19 km southwest of Sudbury, Ontario, occur in host rock composed of feldspathic quartzite of the Mississagi Formation (Huronian Supergroup), which is brecciated and extensively replaced by aegirine, riebeckite, and alkali feldspar. The fenitic assemblages are relatively simple, but they are unusually sodic and deficient in calcium, potassium, and carbonate. Only in the most thoroughly fenitized rocks at Kusk Lake is microcline found. Desilication is a major process in the progressive conversion of the sandstone to a rock in equilibrium with the fluid phase. The scarcity of carbonate material suggests that the igneous source material was essexitic or ijolitic. The ultrasodic assemblages are interpreted as having formed near the heat source but clearly at subsolidus temperatures. Late introduction of potassium is attributed to changes in the geometry of the thermal gradient as the intrusive body cooled. The term *fenitization* should not exclude cases where the resultant bulk compositions are ultrasodic or where the source is an alkaline silicate body rather than a carbonatite. *Key words: igneous petrology, fenitization, metasomatism, riebeckite, aegirine, Mississagi Formation, breccia, desilication.*

☐ 50811—Regional controls on silica sedimentation in the Ouachita system. *Donald R. Lowe, Department of Geology, Louisiana State University, Baton Rouge, Louisiana 70803.* (5 p., 4 figs.)

Deposits of nonterrigenous silica in the Ouachita orogen range in age from Middle Ordovician through Pennsylvanian with principal modes in Upper Ordovician and Devonian-Lower Mississippian strata. The coincidence of Paleozoic Taconic and Acadian orogenesis and Ouachita silica sedimentation is related to regional tectonic patterns and ocean surface-water circulation.

Throughout most of Paleozoic time, Ouachita sediments accumulated in the western part of a marginal sea between the southern edge of the North American craton and an orogenic zone marking the convergent junction between the North American and Gondwana plates. Westerly equatorial surface currents in the Paleozoic Atlantic Ocean were enriched in volcanic silica during orogenesis along the plate junction. Radiolaria flourishing in these currents were carried into the Ouachita basin and contributed significantly to formation of Upper Ordovician chert. Silica-rich waters also originated in areas of upwelling off the west coasts of North America and Gondwana during middle and late Paleozoic time. The eastward flow of this water across the Mexican peninsula and into the Ouachita basin was promoted by rises of sea level and by the disruption of westerly equatorial circulation. The accumulation of Radiolaria carried by these currents and indigenous silica-sponge remains along the northern and western margins of the Ouachita basin and on adjacent shelves led to the formation of Devonian-Lower Mississippian novaculite and correlative shelf chert and siliceous carbonate rock. *Key words: sedimentation, orogeny, silica, chert, Ouachita.*

☐ 50812—Deposition rates in valleys determined using fallout cesium-137. *Jerry C. Ritchie, Paul H. Hawks, and J. Roger McHenry, USDA Sedimentation Laboratory, P.O. Box 1157, Oxford, Mississippi 38655.* (3 p., 4 figs., 1 tbl.)

Many of man's cultural activities have accelerated the rate of deposition of sediment in valleys, yet in most places these rates are low and difficult to measure. Sediment profiles in northern Mississippi had a range of deposition rates from 0.9 to 6.5 cm/yr as determined using fallout cesium-137. These deposition rates are similar to rates determined along these same ranges using the survey techniques. These estimations can be made for valleys where no previous data are available. *Key words: alluvium, sedimentation methods, geochronology, recent sediments, fluvial deposition.*

☐ 50813—Seismic moments of the larger earthquakes of the southern California region. *Thomas C. Hanks, Earthquake Engineering Research Laboratory and Seismological Laboratory, California Institute of Technology, Pasadena, California 91125; James A. Hileman, Seismological Laboratory, California Institute of Technology, Pasadena, California 91125; and Wayne Thatcher, National Center for Earthquake Research, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94025.* (9 p., 4 figs., 4 tbls.)

The seismic moment (M_0) of an earthquake is a more consistent and more physical measure of source strength than magnitude or strain release, and this measure of source strength is determined for 47 of the larger earthquakes occurring in the southern California region since 1857. Most of the seismic moments are obtained by conventional seismological means, but a relationship between the seismic moment and the areal distribution of intensity is developed and scaled to estimate magnitude when intensity data are available but instrumental data are not. For the region as a whole, earthquakes at the threshold of $M_0 \geqslant 10^{25}$, $\geqslant 10^{26}$, and $\geqslant 10^{27}$ dyne-cm have occurred once every 3, 8, and 25 yr, respectively. The spatial occurrence of the five largest earthquakes ($M_0 \geqslant 1 \times 10^{27}$ dyne-cm) is not limited to a particular geologic province, mode of tectonic accommodation, or geographic locality. It is unlikely that this data set can reliably predict long-term spatial and temporal patterns of the $M_0 \geqslant 10^{25}$ dyne-cm seismicity of the southern California region.

☐ 50814—Seismic slip distribution along the San Jacinto fault zone, southern California, and its implications. *Wayne Thatcher, National Center for Earthquake Re-*

search, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94025; James A. Hileman, Seismological Laboratory, California Institute of Technology, Pasadena, California 91125; and Thomas C. Hanks, Earthquake Engineering Research Laboratory and Seismological Laboratory, California Institute of Technology, Pasadena, California 91125. (7 p., 7 figs., 1 tbl.)

The amount and distribution of seismic slip along 240 km of the San Jacinto fault zone between Cajon Pass and Superstition Mountain have been obtained from determinations of seismic moment and estimates of source dimension for each of the nine moderate earthquakes ($6 < M < 7$) which have occurred there since 1890.

There is a significant gap in seismic slip between Cajon Pass and Riverside and another between Anza and Coyote Mountain. Each is about 40 km long, and both are characterized by complex fault zones and a currently high level of minor seismicity ($M < 5$). No aseismic fault creep has been identified on either segment. These gaps may mark the sites of the next moderate earthquakes ($M = 6 \rightarrow 7$) to occur along the San Jacinto fault zone. The two remaining sections of the fault, Riverside and Anza, and Coyote Mountain to Superstition Mountain, may have been ruptured along their entire lengths in 1890-1923 and 1942-1968, respectively.

☐ 50815—Age of metamorphism and uplift in the Alpine schist belt, New Zealand. *D. S. Sheppard, Joint Mineral Sciences Research Laboratory, Victoria University, Wellington, New Zealand (present address: Chemistry Department, University of Otago, Dunedin, New Zealand); C. J. Adams, Institute of Nuclear Sciences, Department of Scientific and Industrial Research, Lower Hutt, New Zealand; and G. W. Bird, Joint Mineral Sciences Research Laboratory, Victoria University, Wellington, New Zealand.* (7 p., 5 figs., 1 tbl.)

Potassium-argon ages from the Alpine schist belt in southeast Nelson, New Zealand, range from 6 to 143 m.y.; the youngest ages are from rocks closest to the Alpine fault. The K-Ar ages cannot be consistently correlated with metamorphic grade, and degassing of minerals has occurred on a small scale, producing a smooth radiogenic argon concentration gradient spatially related to the Alpine fault. Degassing does not appear to have involved net argon loss or gain from the schist belt as a whole.

The setting of the K-Ar ages in the regional context of the Mesozoic Rangitata orogeny allows a reassessment of previous models of metamorphism and uplift of the schist belt, and a new model of two-stage uplift and metamorphism in Late Jurassic and late Cenozoic times is proposed. Metamorphism of schist occurred in Jurassic time, followed by uplift and cooling during mid-Cretaceous time. In late Cenozoic time, vigorous vertical movements of the Alpine schist belt initiated degassing of radiogenic argon, resulting in a spectrum of disturbed "Rangitata" ages from 4 to 140 m.y. along a narrow belt close to the Alpine fault. It is estimated that 5,000 m of uplift commenced 4 ± 2 m.y. ago. *Key words: Alpine schist belt, metamorphism.*

☐ 50816—Modern versus relict sediment on the continental shelf. *Dean A. McManus, Department of Oceanography, University of Washington, Seattle, Washington 98195.* (7 p., 6 figs., 1 tbl.)

Sediment (deposits of unconsolidated material) on the continental shelf is affected by two groups of sedimentary processes that differ in nature and disposition with time. One of these groups of processes supplies particles to the shelf, and if it does so at present, we may say that the particles are now being supplied; otherwise the particles were supplied in the past. The other group of processes distributes the particles on the shelf to form them into sedimentary deposits; if this group is operating at present, we may say that the resulting deposits are modern; otherwise they are relict.

The interrelations of these two groups of processes are used to classify shelf sediment into five classes of sediment process-age: Neoteric sediment is a modern deposit that consists of particles now being supplied to the shelf. Proteric sediment is a modern deposit that consists of particles supplied to the shelf before the present. Amphoteric sediment is a modern deposit that consists not only of particles now being supplied to the shelf, but also of particles that were supplied to the shelf before the present. Palimpsest sediment is a relict deposit that mainly contains particles supplied to the shelf before the present but also includes some particles now being supplied to the shelf. Relict sediment is a relict deposit that consists solely of particles supplied to the shelf before the present. At a given locality, the duration of present-day conditions varies with the intensity of the sedimentary processes; between localities, the duration varies inversely with the rate of sediment accumulation. These expanded concepts that concern modern and relict sediments are aimed at assisting the extrapolation of measurements of sedimentary processes into unmonitored areas of the shelf. *Key words: marine geology, sedimentary petrology, continental shelf, marine sediment, sediment nomenclature, oceanography.*

☐ 50817—Medals and awards for 1974.

Presentation of the Penrose Medal to Maurice Ewing. *Citation by Frank C. Whitmore, Jr. Response by Harriet G. Ewing.*

Presentation of the Arthur L. Day Medal to Alfred Edward Ringwood. *Citation by Brian J. Skinner. Response by Alfred Edward Ringwood.*

Presentation of the Kirk Bryan Award to Robert V. Ruhe. *Citation by George W. White. Response by Robert V. Ruhe.*

Presentation of the O. E. Meinzer Award to R. Allan Freeze. *Citation by John D. Bredehoeft. Response by R. Allan Freeze.*

Presentation of the E. B. Burwell, Jr., Memorial Award to Robert F. Legget. *Citation by David J. Varnes. Response by Robert F. Legget.*

Council actions

The following actions were taken by the Council at its recent meeting in Boulder, May 11-12, 1975.

1. Adopted a revised dues structure—effective 1-1-76—with the opportunity to subscribe to the Society's publications desired.
2. Discussed the break-even operating budget for 1976.
3. Established for a period of one year, effective immediately, that reimbursement for those required to attend committee and Council meetings be set at travel by economy fare plus $10 per day subsistence, officers excluded.
4. Selected a firm of certified public accountants to be presented by ballot to the membership in October for election to perform an audit of the financial records of the Society for the year ending 12-31-75.
5. Rescinded the May 1974 Council action concerning the Society's fiscal year; retained current procedure of fiscal year coinciding with the calendar year.
6. Approved certain financial resolutions.
7. Approved the Salt Lake City annual meeting budget as presented.
8. Voted to decline the invitation from Portland State University to host the Society's 1981 annual meeting.
9. Ratified the appointment of Paul M. Kavanagh as General Chairman of the 1978 GSA-GAC-MAC joint annual meeting to be held in Toronto, October 23-25, 1978.
10. Directed that the Society will hold four-day annual meetings, beginning in 1976.
11. For the 1976 annual meeting in Denver: Approved the use of a slogan, and authorized the Local Committee to have as many as 70 technical sessions instead of 60.
12. Discussed the appointment of a new Science Editor.
13. Commended Henry Spall for his efforts as Editor of *Geology*.
14. Discussed the Society's book-publishing methods.
15. Established publication policies concerning marketability, editorial work, and format.
16. Increased nonmember subscription rates to *Geology*, *Bulletin*, and *Abstracts with Programs*, effective 1-1-76.
17. Voted to charge the senior author a $15 fee if the original copy of an accepted abstract will not reproduce satisfactorily and it must be retyped at headquarters.
18. Established a $20 publication charge for all abstracts accepted for the national and sectional meetings.
19. Selected a slate of nominees for officers and councilors for 1976 to appear on the ballot for the 1975 corporate meeting.
20. Approved the roster of the 1975 Joint Technical Program Committee.
21. Authorized the Investments Committee to investigate financial management firms and report to the October Council.
22. Approved 95 research grants totaling $62,430 for 1975; voted that, if the financial circumstances of the Society permit, the Executive Committee be authorized, at its February 1976 meeting, to increase the funds available for the 1976 research grants program up to $100,000; voted to publish the names of recipients of oil company funds, their institutions, grant titles, and names of donors in the News & Information section of *Geology*; commended George deVries Klein for his 1975 research grant fund-raising efforts and named him committee conferee for 1976.
23. Named the recipient of the first Harold T. Stearns Fellowship.
24. Advanced 50 Members to Fellowship; ratified the election of 445 candidates to Membership; abolished the $5 transfer fee charged Student Associates when transferring to Member.
25. Approved 5 Penrose Conferences; designated a portion of the Penrose Conference registration fees to help cover headquarters logistical and administrative support; permitted the committee to consider co-sponsorship of conferences on an individual basis; encouraged conveners to seek outside funding for support of foreign participants; authorized the committee to give final approval of proposals; instructed the committee to include a section in its future reports to Council on the success or nonsuccess of each conference; reduced the required time from initial formal announcement to actual holding of a conference from nine to six months; discussed conference feedback and outside review of proposals.
26. Discussed the Wallace R. Hansen Panel called by the Committee on Environment and Public Policy and the resultant information paper; noted receipt of the NSF grant that is to be used in connection with the 1975 information papers; voted to give the information papers planned for 1975, within the limits of practicality, the same distribution as previous papers as long as the NSF grant lasts.
27. Selected Penrose and Day medalists; elected two Honorary Fellows; approved the award winners from four divisions; and selected a nominee for the 1975 National Medal of Science.
28. Approved certain changes in the Society's committee structure to take effect at the Salt Lake City meeting.
29. Accepted with regret the resignation of Tj. H. van Andel as chairman of the Budget Committee.
30. Accepted the resignation of Clyde Wahrhaftig as chairman of the ad hoc Committee on Minority Participation in the Earth Sciences and appointed Louis C. Pakiser in his place; voted to continue the minority scholarship fund check-off box on the dues statement.
31. Confirmed the dates of October 18, 19, and 22, 1975, for the fall Council meetings in Salt Lake City, Utah; set the date and time of the corporate meeting as October 21, 1975, from 8 to 9 a.m., in Salt Lake City.
32. Designated three proxy holders and tellers of election for the corporate meeting in October.
33. Named representatives to GSA/ASCE Joint Committee on Engineering Geology; GSA/SSSA Inter-Disciplinary Committee; Advisory, U.S. National Committee for the International Hydrological Program; Advisory Committee, Circum-Pacific Council for Energy and Mineral Resources; Assembly of Mathematical and Physical Sciences, NRC.
34. Accepted reports from GSA sections, divisions, and representatives to non-GSA groups. Set the minimum registration fee for section annual meetings at $7.50 and the maximum at $12.
35. Ratified the amended bylaws of the South-Central Section.
36. Voted to co-sponsor the William T. Pecora Memorial Symposia without a financial commitment.
37. Suggested ideas to the Committee on Scholarly Communication with the People's Republic of China to assist in the exchange programs being broadened in the natural and social sciences and humanities to promote scholarly communication between the U.S. and China.
38. Took other minor actions, records of which are on file at headquarters.