Mountain, numerous falling-head injection tests have been conducted in test holes. Below are the results of these tests:

Analyses of 26 falling-head injection tests in test well U-25c-f1 indicate that conventional type curves do not accurately predict the flow of water into the fractures. To explain the recovery curves this study developed special type curves for falling-head injection tests. The flow with infinite outer boundary does not apply to the injection tests. The recovery curves of normalized hydraulic head versus log time exhibit steeper tails than do the Cooper-Jacob graphical method. To explain the recovery curves with steeper tails, solutions for falling-head injection tests with infinite outer boundary were derived analytically by Karasaki and compared to the test results: (1) spherical flow, infinite outer boundary; (2) linear flow, infinite outer boundary; (3) radial flow, constant-head outer boundary; (4) radial flow, constant-head outer boundary; (5) linear flow developing into radial flow, infinite outer boundary; and (6) linear flow developing into circular flow, infinite outer boundary. In addition to these six solutions, a solution that incorporates a finite thickness also was seen in the tests.

Several of the solutions had steeper tails than did the Cooper-Jacob or the Rayleigh-Papadopoulos type curves, but none matched the response observed in the tests well U-25c-f1. The occurrence of non-linear flow in the fractures would result in curves with steeper tails and may explain the test results. In general, the non-linear flow for falling-head injection tests may not be valid for fractured media.

A separate study of the conditions for this behavior is needed.

### Sedimentologic and Tectonic Aspects of the Archean Lithotype


There are marked lithic differences between the central Limpopo belt and other well-studied Archean high-grade and greenstone-granitoid terranes, in particular the presence, and the thickness of sections of calc-silicate and calc-silicate rocks and 2 pure metagabbro, often fuchsite-bearing, with the lithic character of quartz arenite, not metachert. These two suites overlie basement gneisses; these probably reflect substantial strain and are similar to those associations known to have formed on Atlantic-type continental margins. Isotopic ages suggest these sediments are about 3.3-3.5 Ga in age. The distribution of lithic, plutonic, metamorphic, and structural elements in the Limpopo belt resembles that in younger orogens where there has been rifting of continental lithosphere, deposition of sediments on continental margins, and collision with another continental block. The structural, metamorphic and condensational condition of the rocks largely reflects crustal thickening during final collision. The southern margin of the central belt is a wide (20 km) zone of verticallly-dipping, horizontally-lined molybdenite, clearly representing the deepest ducastic levels of a major strike-slip fault. This fault resembles large strike-slip systems that allow tectonic escape during collision in young oceanic belts. We conclude that continental fragments large enough to allow a significant platform are carbonated sedimentation, and the following combinations of flow field and boundary conditions were derived analytically by Karasaki and compared to the test results: (1) spherical flow, infinite outer boundary; (2) linear flow, infinite outer boundary; (3) radial flow, constant-head outer boundary; (4) radial flow, constant-head outer boundary; (5) linear flow developing into radial flow, infinite outer boundary; and (6) linear flow developing into circular flow, infinite outer boundary. In addition to these six solutions, a solution that incorporates a finite thickness also was seen in the tests.

Several of the solutions had steeper tails than did the Cooper-Jacob or the Rayleigh-Papadopoulos type curves, but none matched the response observed in the tests well U-25c-f1. The occurrence of non-linear flow in the fractures would result in curves with steeper tails and may explain the test results. In general, the non-linear flow for falling-head injection tests may not be valid for fractured media.

### X-Radiographic of Trance Fossils in Limestones and Dolomites on the Jurassic Smackover Formation

**Essig, Richard A., Castlemann, Stephen P., and King, David T., Jr., Department of Geology, University of Alabama.**

X-ray analysis has been used in studying biogenic sedimentary structures in undifferentiated sediments but the technique has not been applied often to the study of hard carbonate rocks. This study was done to the study of the Smackover Formation to enhance the complete petrologic description of the rock. The Smackover Formation has many dense micritic intervals and intervals of marmorons, porcellanos, and algal fabrics. This study was done to see if x-ray analysis can be used in the Smackover Formation.

The dolostones show no traces using our method. In limestones, the traces are marked by minute amounts of finely divided iron sulfides. The X-ray analysis shows a slight difference between the two x-ray analysis.

### Occurrence of Native Silicon in a Fulgurite and Other Extreme Conditions

**Essene, Eric J., Dept. Geol. Sci., Univ. Michigan, Ann Arbor.**

Native silicon was discovered in fulgurite recently formed on til near Washoe Lake, N.J. Further examination of miscast nickel metal globules in fulgurite glass reported by Essene and Fisher (GSA Abstr. w. Prog., 1984) has revealed native silicon as euhedral crystals in metal and intergrown with Sb-rich glass in the fulgurite matrix. Microprobe analysis gives Fe, Cu, S, Al, and Mg. The data is confirmed by scans showing N, C, O at 0.2% detection limits. X-ray powder data reveals the major peaks for Si, and confirmed its existence in the fulgurite. The data is in agreement with a theoretical interpretation of the data.

The stability of Si is limited by the reaction:

\[ SiO_2(s) + O_2(g) \rightarrow SiO_2(l) + 2e^{-} \]

which requires F, O, and CO to be present to stabilize native iron. This reaction is driven by a loss of O and/or CO from the medium or by a decrease in temperature. This reaction is limited by the presence of oxygen and carbon dioxide, which may be present in some fulgurite to stabilize native iron. The reaction is in agreement with the data recorded by persistent reports of other highly reduced minerals, such as S, Cu, Cr, Cu, and Te or Mo/Si. This reaction may be used as a method to determine the stability of native iron.

### Annual Meeting, Orlando, Florida

**ANNUAL MEETING, ORLANDO, FLORIDA**

575
PREECAMBRIAN GEOLOGY II
South Hall B, Convention Center, 1:00 p.m.
William S.P. Kidd and Warren C. Day, Presiding

1 John C. Green*, Val C. Chandler: DIABASE DIES OF THE MIDCONTINENT RIFT IN MINNESOTA: A RECORD OF KENNEWAN MAGMATISM AND TECTONIC DEVELOPMENT [64738] 1:00 P


5 David B. Ward*, Jeffrey A. Grabling: DATING A PROTEROGENIC METAMORPHIC EVENT USING Rb-Sr GEOCHRONOLOGY: AN EXAMPLE FROM NORTHERN NEW MEXICO [78372] 2:00 P

6 H.K. Breuckner*, R.C. Hardcastle, R.P. Hanson, T.J. Wilson: A Rb-Sr age from the CHOMA-KALMOO BATHOLITH, EVIDENCE FOR THE IRONIC BELT IN SOUTHERN ZAMBIA, AFRICA [64510] 2:15 P


9 W.J. Olazewski, Jr., A.K. Gibbs, R.C. Gaudette: Rb-Sr and Sm-Nd whole rock analyses of BASALTS OF THE GAJO PARA GROUP, SERRA DOS CARAJAS, BRAZIL [76007] 3:00 P

COFFEE BREAK 3:15 P

TECTONICS V: PREECAMBRIAN TECTONICS

10 Kevin Burke, W.S.P. Kidd, T.M. Musky*: ARCHEAN FORELAND BASIN TECTONICS FROM THE WITTENBERGAA, SOUTH AFRICA [67100] 3:30 P


12 George N. Fair*: EVOLUTION OF THE ABIR TERRANE AND PHAEROGEO RIFTING IN SOUTHWESTERN SAUDI ARABIA [73996] 4:00 P


14 F.R. Sims*, S.E. Peterman: EARLY PROTOEROGENIC TECTONICS IN THE NORTH-CENTRAL UNITED STATES [73461] 4:30 P


SEDIMENTARY GEOLOGY III

8EF Orange Blossom, Convention Center, 1:00 p.m.
W. F. Tanner and Paul A. Baker, Presiding

1 Ellen A. Cowan*, James D. Duncker, Ross D. Powell: PROCESSES OF DEPOSITION OF INTERLAMINATED SAND-AND-CLAY AT A TEMPORARY TIDAL FLAT [64840] 1:00 P

2 William F. Tanner*: HYDRODYNAMIC MEASURES AND GRAIN SIZE ANALYSIS [69505] 1:15 P


4 Paul D. Komar*: GRAVEL THRESHOLD, SELECTIVE ENTRAINMENT AND FLOW COMPETENCE [76183] 1:45 P

5 Anthony R. Prave*: CAN HUMMOCY CROSS STRATIFICATION BE FORMED BELOW EFFECTIVE WAVE BASE? [72802] 2:00 P


9 M. Carmela Cuomo*, Donald C. Rhoads: BIOGENIC SEDIMENTARY CYCLES RELATED WITH PIONEERING POLYCHAETA ASSEMBLAGES [68361] 3:00 P


VOLCANOLOGY: CHEMICAL AND PHYSICAL PROCESSES

8AB Orange Blossom, Convention Center, 1:00 p.m.

Stephen A. Nelson and W. K. Hart, Presiding


2 Daniel R. Shave*: ASH-FLOW ERUPTIVE MEGABRECCIAS IN THE SOUTHERN TOQUIMA RANGE, Nye COUNTY, NEVADA [74284] 1:15 P


4 Laura L. Kedzie, John F. Sutter*, C.B. Chapin: HIGH-PRECISION 40Ar/39Ar ages of WIDESPREAD OLIGOCENE ASH-FLOW TUFFS NEAR SOCCORO, NEW MEXICO [71775] 1:45 P

5 Lisa A. Gilbert*, K.A. Foland: EXCESS 40Ar IN MINERALS OF A SHALLOW PLUTON, THE MOUNT ST. HILAIRE COMPLEX, QUEBEC [73684] 2:00 P


7 JoAnn Hegre*, Stephen A. Nelson: GEOLOGY OF VOLCANIC LAS NAVAJAS, A PLEISTOCENE Tephra/PEDEERIAL CALDERA VOLCANIC CENTER IN Nayarit, Mexico [55755] 2:30 P

8 Stephen A. Nelson*, JoAnn Hegre*: COMEDENTIC AND PANTHELLETERIC ASH-FLOW TUFFS FROM VOLCANIC LAS NAVAJAS, Nayarit, Mexico [57552] 2:45 P

9 Lori A. DeRemer*, Stephen A. Nelson: GEOLOGIC AND CHEMICAL EVOLUTION OF VOLCANIC TEPHRA, MEXICALI [64644] 3:00 P


11 Craig A. Chesner*: HIGHLY EVOLVED RHYOLITIC GLASS COMPOSITIONS FROM THE TOTA CALDERA, LAUARINA [63565] 3:30 P


ABSTRACTS with PROGRAMS 1985

98th Annual Meeting

The Geological Society of America

The Paleontological Society (77th)
The Mineralogical Society of America (66th)
The Society of Economic Geologists (65th)
Cushman Foundation (36th)
Geochemical Society (30th)
National Association of Geology Teachers (26th)
Geoscience Information Society (20th)

OCTOBER 28-31, 1985  ORLANDO, FLORIDA
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