A MODEL FOR THE ORIGIN OF MAFIC AND ULTRAMAFIC DIKES IN THE PERIDOTITIC UPPER MANTLE SECTION OF OPHIOLITES BASED ON RELATIONSHIPS IN THE WHITE HILLS PERIDOTITE, NEWFOUNDLAND | № 69091

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Studies to define the origin of mafic and ultramafic dikes that are ubiquitous to the peridotitic upper mantle section of ophiolitic complexes have been the interest of many investigators. The proposed modes of origin for these dikes range from the streaming of silica undersaturated and saturated vapors through the peridotite to episodic polybaric partial melting of garnet or spinel peridotite source material with polybaric fractional crystallization of these same partial melt liquids.

On the basis of bulk rock(major, trace, REE)and mineral analyses, two overall geochemical patterns appear to exist for the White Hills:1. A trend defined by most of the pyroxenites and gabbroic dikes and preserved best by decreasing Mg/(Mg + Fe) ratios, increasing titanium content in clinopyroxene, and a nearly constant alumina content in the pyroxenes; and 2. a trend (grouping) defined by the chromite-related lithologies and preserved best by high Mg/(Mg + Fe) ratios, low titanium and aluminum contents in the pyroxenes, and chrome-rich spinel. The difference between the groups suggests their formation under different P-T conditions, but more importantly, from different parent liquids.

The model envisages polybaric crystallization, cotectic and non-cotectic, of an olivine tholeiitic liquid derived from partial melting of the spinel lherzolite source to yield the lithologies of trend 1.Renewed localized partial melting of the nearly depleted spinel lherzolite at low pressure produces a liquid of magnesium-quartz tholeiite composition which crystallizes to yield the lithologies of trend 2. In addition to the magmatic origin for most dikes, an alternative mechanism by mechanical segregation during upper mantle deformation may be required to explain the origin of some of the high-alumina pyroxenite and dunite dikes.

PROVENANCE OF THE TACONIC FLYSCH OF NEW YORK | № 68433

TANSKI, Steven and KIDD, W.S.F., Geological Sciences, S.U.N.Y. at Albany, Albany, N.Y., 12222

The Taconic flysch of New York, of Caradocian age, reflects erosion from tectonic lands overthrusting the eastern margin of North America. Point-counting of 240 samples distributed over the entire outcrop belt, about 250 km along strike (N-S) and 190 km across strike (E-W) shows that no great differences exist along strike in the oldest (allochthonous) flysch, despite paleocurrents that suggest deposition in a number of small fans. Across-strike, the basal flysch is progressively younger to the west and significant differences in provenance are seen between the older and younger sediments, particularly an increase in K-feldspar and carbonate in younger sands. Molassic sandstones and conglomerates locally preserved in the southeast, and of similar age to the westernmost flysch, also show this change relative to older underlying flysch sandstones. It may indicate the progressive exposure of Grenville basement and covering shelf carbonates, by overthrusting. The alternative source for the K-feldspar might be upthrust late-preCambrian rift facies sediments, with carbonate derived from shelf carbonate slivers attached to imbricate thrusts. Either case requires development of imbricate, out-of-sequence thrusts cutting at least the carbonate shelf and previously emplaced allochthonous sediments. Most of the early flysch sands are thought to be derived from recycled continental rise sediments (Taconic Allochthon source); this source also makes up a substantial fraction of the younger sediments. Volcanic clasts of both mafic and silicic composition are at most a few percent of any sample. No significant ophiolite derived detritus was seen (although very small quantities of chromite do occur in the oldest flysch) and no aluminosilicate or blueschist minerals were detected. The source area (to the south and east) did not contain substantial ophiolite sheets, unlike the north and easterly-derived flysch of Quebec and Newfoundland.

GEOCHEMICAL EVIDENCE FOR CUMULATE PETROGENESIS OF CHROMITITE FROM THE WOOD MINE, LANCASTER COUNTY, PA. | № 72904

THOMAS, R. B., GOTTLIEB, O. J., and FRIBERG, V. M., Department of Geology, The University of Akron, Akron, OH 44325.

Chromitite from the Wood Mine comprises part of the ultramafic portion of an ophiolite suite. Ophiolite peridotites fall in two groups, deep mantle metamorphic peridotites and cumulate peridotites. Microprobe analyses of unzoned, unaltered chromites from the Wood Mine show high Cr concentrations comparable to cumulate peridotites from New Caledonia, and correspondingly low Al suggesting a low pressure origin. This is quantified in the Cr/Al ratio (Cr X 100/Cr + Al) which has been used to distinguish the two types. Wood Mine chromites fall in the range of the cumulate peridotite, averaging 65.

Another index of cumulate origin is the Cr/Fe ratio of chromites which varies between 0.8 and 2.0 for layered intrusions and 4.0 for ultramafic inclusions in kimberlites. Unaltered Wood Mine chromite ratios range from 1.80 to 1.85.

Zoned chromites show both an Al depletion trend and an Fe enrichment trend interpreted to be a result of serpentinization.

Trace element concentrations measured by INAA also show the effects of serpentinization. Ti, V increase and Mn decreases with degree of serpentinization. Anomolous As concentrations of up to 30 ppm in the silicate and 6 ppm in the chromite layer are interpreted to be related to serpentinization.

GROWTH, BREAKAGE, AND RESISTANCE TO BREAKAGE IN THE SHELLS OF BIVALVE MOLLUSCS | № 56725

THOMAS, R. D. K., Department of Geology, Franklin and Marshall College, P.O. Box 3003, Lancaster, PA 17604

Articulation of the bivalve shell and its accretionary growth pattern place conflicting constraints on its form. As a result, the elastic ligament must necessarily break as it grows, except in very small bivalves. This breakage is in large part responsible for strong allometric growth of the ligaments of diverse living and extinct bivalves, such as arcoids, oysters and scallops. In Laternula, Periploma and Pinna bicolor, articulation or closure of the shell involves flexure and the development of regular fractures in the valves themselves, during growth. In its normal operation, the bivalve shell acts as a pair of beams loaded under opposing stresses exerted by the adductor muscles and ligament. Wainwright (1969) showed how the resulting strain is built into the shell, as new layers are added to its interior surface. The stress distribution induced by an attempt to crush the shell, or by violent adduction, is very different. Here the shell acts as a dome, as a shell in the architect's sense. Compressional stress is exerted in the outer shell layer and tension in the inner layer. The usual distribution of shell microstructures is consistent with this stress pattern and the shell is prestressed in the right direction to aid in resisting deformation. But, the prestressed shell, developed only between the adductors and hinge, is only fortuitously advantageous, since it forms as an inevitable consequence of shell growth and articulation. This model of bivalve shell stress and strain predicts that denticulations of the inner shell margin serve to resist imposed compressional stress, which can be tested directly.

VERTICAL SEQUENCE, BARRIER EVOLUTION AND SIGNATURE, BASED ON SEDIMENTARY ENVIRONMENT GRAIN-SIZE ANALYSIS | № 69952

TOSCANO, Marguerite A., Department of Geology, University of Delaware, Newark, DE 19716

Qualitative models have been advanced to depict the evolution of various sedimentary systems (including transgressive marine systems) in a vertical sense (e.g., Visher, 1965) based on trends in grain-size, sorting, and sediment type. These models have been proposed as aids to the recognition of a number of sedimentary systems, both in outcrop and in coring studies. This study presents a quantitative evolutionary model for Delaware's Holocene transgression barrier coast. Present barrier sub-environments of deposition have been sampled and characterized in terms of grain-size distributions and depositional processes, using discriminant analysis and other criteria. In addition, a transect of 5 deep-penetration drill holes (25'-63') through the barrier at Dewey Beach, DE, and a similar transect at Cape Henlopen Spit, have been previously analyzed for grain-size distributions. Radiocarbon ages on peat have also been determined for these cores.

Application of the discriminant function calculated for present sedimentary subenvironments to grain-size distributions of core sediments of "unknown" origin is the main basis for assignment of core sediments to their probable depositional environments, resulting in a vertical sedimentary sequence ("signature") and evolutionary model for the Delaware barrier coast. It is anticipated that the ability to identify unknown depositional environments on a statistical basis will have applications to studies of pre-Holocene deposits in Delaware and other localities on the Atlantic Coastal Plain.

FACTORS AFFECTING MIGRATION AND RECOVERY OF SEPARATE PHASE ORGANICS IN GROUNDWATER | № 72158

TRIEGEL, Elly K., 1503 N. Gravel Pike, Perkiomenville, PA 18074

Transport and recovery of separate phase organics in groundwater is affected by the balance of forces acting on the liquids. These may include the attraction of the liquid molecules (organics and water) for each other and for solid surfaces (matric/capillary potential), or pressure, osmotic and gravity potentials. The relative importance of these potentials is a function of fluid properties such as density, viscosity and surface tension; and properties of the rock matrix such as pore size and geometry, initial water content, wettability of the surfaces and heterogeneities in pore size distribution. The dynamic system may also be characterized by a distinct hysteresis between the "wetting" (advancing) and "drying" (withdrawal/recovery) cycles. This arises from a number of factors including changes in energy

6 **George D. Guthrie*, Charles W. Burnham:** PETROLOGY AND ORIGIN OF CALC-SILICATE BODIES FROM THE RANGELEY FORMATION, NEW HAMPSHIRE [65964] 1530

7 **Timothy J. Fagan*:** DOES THE MASSABESIC GNEISS COMPLEX, SOUTHEASTERN NEW HAMPSHIRE, INCLUDE A PARTIAL MELT OF THE BERWICK FM? [72150] 1550

8 **K.H. Gronwald*, M.S. Rutstein, H.W. Krueger, D.L. Conrad:** AGES OF METAMORPHISM OF THE MARTINSBURG FORMATION OF SOUTHEASTERN NEW YORK [72608] 1610

9 **Alice L. Hoersch*, William A. Crawford, Kenneth D. Woodruff:** A REEXAMINATION OF THE MINE RIDGE, S.E. PA. [58818] 1630

10 **George H. Myer*, Patrick S. Baker, Bruce R. Cushing, Mary Louise Hill:** METAMORPHISM AND DUCTILE SHEAR ALONG THE MARTIC "ZONE" IN SOUTHEAST PENNSYLVANIA [69035] 1650

11 **T.M. Burke*, P.A. Candela, A.G. Wylie:** EVIDENCE FOR DETRITAL ULTRAMAFIC BODIES IN THE EASTERN PIEDMONT OF MARYLAND [72039] 1710

GLACIAL AND QUATERNARY GEOLOGY
Monte Carlo Room, Host Farm Resort Motel, 1330 hours

James F.P. Cotter and P. Thompson Davis, Presiding

1 **Byron D. Stone*:** PROGRESS TOWARD A QUATERNARY STRATIGRAPHY OF THE NORTHEASTERN UNITED STATES [70290] 1330

2 **Thomas K. Weddle*:** CORRELATION OF SUBAQUATIC GLACIAL DEPOSITS ALONG AUSTIN STREAM, BINGHAM, MAINE, WITH TILL STRATIGRAPHY AT NEW SHARON, MAINE [66623] 1350

3 **George M. Haselton*:** GLACIAL GEOLOGY OF THE UPPER BAKER RIVER VALLEY, NEW HAMPSHIRE [69015] 1410

4 **Carl Koteff*, Frederick D. Larsen:** POSTGLACIAL UPLIFT IN THE CONNECTICUT VALLEY, WESTERN NEW ENGLAND [70291] 1430

5 **Paul R. Bierman*, David P. Dethier:** DEGLACIATION OF NORTHWESTERN MASSACHUSETTS [59277] 1450

COFFEE BREAK 1510

6 **Peter Clark, James S. Street*:** DEGLACIATION OF THE NORTHWESTERN ADIRONDACK MOUNTAINS AND NORTHWARD ENCROACHMENT OF LAKE IROQUOIS [72164] 1530

7 **Jack C. Ridge*, William J. Brennan, Ernest H. Muller:** LATE WISCONSINAN GLACIAL AND PALEOMAGNETIC RECORD OF THE WESTERN MOHAWK VALLEY, N.Y. [63402] 1550

8 **P. Jay Fleisher*:** LANDFORMS AND STRATIGRAPHY OF STAGNANT ICE DEPOSITION, APPALACHIAN PLATEAU, CENTRAL NEW YORK STATE [70094] 1610

9 **David P. Harper*:** GLACIAL LAKES OF THE EASTERN NEWARK BASIN, NEW JERSEY [67662] 1630

10 **James C. Hall*, Joseph H. Hartshorn:** SOME OBSERVATIONS ON A DYNAMIC MODEL OF WATER CONDUCTING TUNNELS IN GLACIERS, WITH SOME IMPLICATIONS FOR ESKERS [67511] 1650

POSTER SESSION II: STRATIGRAPHY, PALEONTOLOGY, MATHEMATICAL GEOLOGY, GEOLOGY EDUCATION
Exhibit Hall East, Host Farm Resort Motel, 1400 hours-1600 hours

Authors will be present from 1400 to 1600 hours

Linda C. Gundersen*, Allison R. Palmer: CAMBRIAN LITHOFACIES AND FAUNAL DISTRIBUTIONS IN THE APPALACHIANS [74101] .... Booth 1

John H. Way*, Robert C. Smith II: TIOGA ASH ZONE: 6 OR MORE ASH BEDS IN THE VALLEY AND RIDGE OF PENNSYLVANIA [70067] ..... Booth 2

Paul L. Richards*: LATE DEVONIAN PALEOSOILS IN NORTH-CENTRAL PENNSYLVANIA [57836] ..... Booth 3

J. Sweeney*, D. Patchen, M. Hohn: CORRELATION AMONG DEVONIAN SHALE PRODUCTIVITY AND COMPLETION ZONES, STRATIGRAPHY, AND COMPLETION TECHNIQUES, NORTHWESTERN WEST VIRGINIA [67788] ..... Booth 4

Linda L. York*: AMINOSTRATIGRAPHY OF TWO CORES FROM THE EAST-CENTRAL COASTAL PLAIN OF NORTH CAROLINA [69951] ..... Booth 5

Roger J. Cuffey*, Laurie S. Zimmerman, Marshall C. Hewitt, David R. Kobluk: MODERN BONAIRE REEF-CREST BRYOZOANS AS PALEOECOLOGICAL MODELS--ABUNDANCES, DIVERSITY, AND SAMPLING SCALES [72796] ..... Booth 6

Brenda Lint*, William R. Brice: PETROGRAPHIC MANUAL FOR PETROLOGY LABORATORY [68803] ..... Booth 7

Peter L. Guth*: DRILLBIT: INTERACTIVE COMPUTER SIMULATION FOR TEACHING STRUCTURAL AND HISTORICAL GEOLOGY [59222] .... Booth 8

Frank A. Revetta*, P.J. Hafer, J. Bonczar: A GRAPHICAL METHOD FOR LOCATING THE EPICENTER AND FOCUS OF A LOCAL EARTHQUAKE [67572] ..... Booth 9

William R. Brice*, Uldis Kaktins: THE CONEMAUGH GAP. A UNIQUE GEOLOGICAL LABORATORY [68807] ..... Booth 10

Alan D. Smith*: CROSS-VALIDATION TECHNIQUES APPLIED TO HYPOTHESES TESTING AMONG GEOTECHNICAL PARAMETERS TO MEASURE EXTENT OF CONCURRENT VALIDITY [66791] ..... Booth 11

FRIDAY, MARCH 15, 1985

PALEONTOLOGICAL SOCIETY SYMPOSIUM: PALEOBIOMECHANICS
Monte Carlo Room, Host Farm Resort Motel, 0800 hours

John A. Chamberlain, Jr. and Richard R. Alexander, Presiding

1 **Alan H. Cheetham*:** MECHANICAL VS. SPATIAL CONSTRAINTS ON ARBORESCENT GROWTH IN EVOLUTION OF CHEILOSTOME BRYOZOANS [59212] 0800

2 **Michael LaBarbera*, Sharon Guzik:** HYDRODYNAMICS OF FENESTELLID BRYOZOANS [72583] 0820

3 **Richard R. Alexander*:** COMPARATIVE RESISTANCE OF BRACHIOPOD SHELL ARCHITECTURES TO COMPRESSIONAL FORCES [59211] 0840

4 **R.D.K. Thomas*:** GROWTH, BREAKAGE, AND RESISTANCE TO BREAKAGE IN THE SHELLS OF BIVALVE MOLLUSCS [56725] 0900

5 **Geerat Vermeij*:** BURROWING SPEED OF HIGH-SPIRED GASTROPODS [69905] 0920

COFFEE BREAK 0940

6 **John A. Chamberlain Jr.*, Rebecca B. Chamberlain:** SEPTAL FRACTURE IN **NAUTILUS**: IMPLICATIONS FOR CEPHALOPOD PALEOBATHYMETRY [72604] 1000

7 **Ulf Bayer*:** THE BIOMECHANICAL INTERPRETATION OF AMMONITE SEPTA [59214] 1020

8 **Tomasz Baumiller*, Roy E. Plotnick:** FUNCTION OF WING PLATES IN **PTEROTOCRINUS** [59213] 1040

9 **R. McNeill Alexander*:** LOCOMOTION OF LARGE DINOSAURS [59220] 1100

10 **J. Scott Turner*:** THERMOREGULATION IN EXTINCT REPTILES. WHAT MORPHOLOGY CAN TELL US [56723] 1120

SYMPOSIUM: THE TACONIAN FLYSCH BELT OF THE APPALACHIANS
Cabaret Theater, Host Farm Resort Motel, 0800 hours

Edward C. Beutner and Peter T. Lyttle, Presiding

INTRODUCTION: Peter T. Lyttle 0800

1 **Stanley C. Finney*:** A RE-EVALUATION OF THE UPPER MIDDLE ORDOVICIAN GRAPTOLITE ZONATION OF NORTH AMERICA [59558] 0810

2 **Steven Tanski, W.S.F. Kidd*:** PROVENANCE OF THE TACONIC FLYSCH OF NEW YORK [68433] 0830

3 **Gary G. Lash*:** DISPERSAL OF MIDDLE ORDOVICIAN FLYSCH DEPOSITS OF EASTERN PENNSYLVANIA [57775] 0850

ABSTRACTS with PROGRAMS 1985

20th Annual Meeting

NORTHEASTERN SECTION

The Geological Society of America

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Paleontological Society

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