GRENVILLE BASEMENT IN THE PIEDMONT EAST OF THE PRE-APPALACHIAN (PRE-CALEDONIAN) EDGE(?) OF THE NORTH AMERICAN CRATON

Nº 20502

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Several recent tectonic models of the Appalachians interpret the western edge of the central Piedmont gravity high as the pre-Appalachian edge of the North American craton (Rankin, 1975; Hatcher and Zietz, 1980; Hatcher, 1982). The Piedmont to the east is variously interpreted as part of Africa, Avalonia, or some "suspect terrane" formed elsewhere.

Mapping of the eastern Piedmont has defined the Grenville age Goochland granulite terrane, 20-30 km in width, running from near Raleigh, N. C. to Fredricksburg, Va. and continuing under Coastal Plain cover to the north. This terrane consists of Grenville garnet-pyroxene and two-pyroxene granulites and sillimanite-K-feldspar pelitic gneisses in a terrane which has been retrogressively metamorphosed by an upper greenschist to middle amphibolite facies Alleghanian event. The Goochland terrane is in pre-Alleghanian thrust contact with the late-Precambrian to early-Paleozoic Eastern slate belt and Chopawamsic volcanics. In the north it lies on and in the south it lies well to the east of the central Piedmont gravity high, and is interpreted to have been thrust from farther east. The simplest explanation for the origin of this terrane is that it is a microcontinent which was rifted from North America in the late-Precambrian and reattached in the mid-Paleozoic.

PRELIMINARY RESULTS OF A DETAILED STUDY OF PART OF THE SAURATOWN MOUNTAINS BASEMENT MASSIF, NORTH CAROLINA

Nº 20504

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Detailed geologic mapping in the southwestern portion of the Sauratown Mountains anticlinorium basement massif has yielded some interesting preliminary results. A sequence of Grenville basement (?) orthogneiss is separated from high grade cover metasedimentary rocks by a mylonitic interval suggesting existence of a premetamorphic detachment thrust. These rocks either grade stratigraphically upward into or metamorphic grade drops upward (southeastward, northwestward) into a kyanite or lower grade assemblage of metasandstone, quartzite, pelitic schist (graphitic to the northwest), and amphibolite (formerly called Ashe Formation). Cover sequences are distinctively different of the NW and SE flanks of the anticlinorium suggesting that if they are the same, considerable shortening has occurred. All the rocks and contacts in this area are polydeformed in the usual sequence of two or more sets of isoclinal folds superceded by crenulation cleavage, then more brittle structures. The entire sequence is cut by brittle Mesozoic faults (Stony Ridge fault zone with small displacement and diabase dikes. Most rock units are superbly exposed in creeks but poorly exposed along roads, which, because most mapping in this region has been reconnaissance, has led to the common misconception of no exposure in this area and the rest of the Piedmont. To date we have made significant changes in locations of contacts on published USGS 2-degree reconnaissance maps raising questions regarding the utility of this program in complex terranes with poor road exposure and little existing detailed geologic mapping.

EVIDENCE AGAINST PRE-GRENVILLE METAMORPHISM IN THE READING PRONG OF SOUTHEASTERN NEW YORK

Nº 21005

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A few reports using Rb-Sr whole-rock and U-Pb zircon data show that the Reading Prong, Manhattan Prong and Blue Ridge contain rocks older than about 1050-1150 m.y., the time of the Grenville high-grade metamorphic event. However, the meaning of the pre-Grenville ages is in doubt. A compilation of Rb-Sr whole-rock isochron ages is shown below (1 sigma error is less than 5% for the ages and less than 0.2% for the initial $^{87}Sr/^{86}Sr$ ratios):

ROCK UNIT	AREA	AGE	I.R.
Fordham Gneiss- outcrop ave.	A	1350	0.7021
Fordham Gneiss- site A	A	1113	0.7248
Fordham Gneiss- site B	A	1100	0.7138
Fordham Gneiss- site C	A	1326	0.7025
Highland Metavolcanics	B	1139	0.7029
Highland Paragneiss	B	1147	0.7046
Storm King Pluton	B	1106	0.7066
Canopus Pluton	B	1070	0.7038
Canada Hill Pluton	B	913	0.7186
Reservoir Granite Gneiss	C	1225	0.7025
Pink Granite Gneiss	D	1045	0.7040

INDEX TO AREAS

A= Manhattan Prong (GSA v. 93, p. 391)

B= Western Side of the Hudson River

C= Eastern Side of the Hudson River

D= New Milford and Housatonic Highland

An examination of these and other data plus a consideration of the behavior of stratified rocks (volcanic and sedimentary) vs. crystalline rocks (plutonic and metamorphic) suggests that the Grenville event was not preceded by a significantly earlier metamorphic event.

A THREE-STAGE MODEL OF ADIRONDACK TECTONIC HISTORY

Nº 14266

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A three-stage tectonic history is proposed to account for the principal features of Adirondack geology. (1) Prior to "Grenvillian" tectonic activity, Proterozoic rocks in the Adirondacks consisted of platform-type sediments with some volcanics, resting unconformably on older basement. About 1.1 ga, mantle upwelling developed along a NNE trend from the southern Adirondacks into the Central Granulite Terrain in Quebec. A large cushion of basaltic magma accumulated between subcrustal lithosphere and the lower crust causing partial melting and intrusion of the mangerite-charnockite suite into higher crustal levels. Fractionation of the basaltic magma led to high-Al basalt which intruded the crust and differentiated further to yield the anorthosite suite (Emslie, 1978). Anorthosite was then diapirically emplaced at relatively shallow depths. (2) Delamination or convective thinning of subcrustal lithosphere was followed by intracontinental subduction, formation of large NE-trending folds and nappes, and SE-over-NW thrusting. Doubling of the continental crust over the Adirondack highlands and the Central Granulite Terrain led to development of the presently observed 8 ± 1 kb metamorphic assemblages. (3) Renewed vertical movements of large, low density and relatively rigid anorthosite bodies produced further intense deformation close to the anorthosite, and deflection of earlier structural trends. Generalized uplift of the zone of doubled crust led to NW tilting of the Carthage-Colton mylonite zone which marks the boundary between the upper (NW lowlands) and lower (Adirondack highlands) crustal slabs. Evidence from numerous recent Adirondack studies is presented in support of this model, and tests of the validity of the model are suggested.

LINEATIONS, SHEATH FOLDS, AND IMPLICATIONS FOR ADIRONDACK TECTONIC HISTORY

Nº 17326

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Quartzofeldspathic gneisses of the southern Adirondacks exhibit pronounced E-W lineations consisting principally of lithic ribbons; mullion-like corrugations; mafic rich streaks; and oriented elongate minerals. The most prominent linear fabric occurs within gneisses of the Piseco Group and the overlying Sacandaga Fm. and is best developed where these units are exposed in the Piseco anticline. Here the rocks resemble pencil gneisses consisting of ribbons of quartz and feldspar. The average dimension of these ribbons is (0.05x0.25x20) cm. The origin of the ribbons has been established by tracing lineated units into regions of lesser deformation where they appear to be megacrystic quartz monzonitic gneisses. Lineation of these rocks is thought to have been caused by regional simple shear accompanied by flattening and resulting in ductile stretching giving rise to EW ribbons, mullions, corrugations, etc.. These lineations parallel the axes of the two earliest recognized fold sets of the region. The first of these is isoclinal-recumbent and the second is open and upright. Recently discovered sheath folds are elongated E-W and appear to consist of early isoclinal axes rotated into their present orientation from an intial N-S alignment. It is believed that the initial isoclinal folding took place in response to E-W simple shear responsible for the strong regional lineation. Perturbations in the flow field resulted in rotation of the early fold axes, bring them into parallelism with the stretching lineations. Upright E-W folds of the second generation may result from convergences in the flow field. The assymetry of feldspar augen and their tails suggest that displacement in the simple shear field was east side up and to the west. The Carthage-Colton mylonite zone may represent a zone of high strain parallel to the plane of regional simple shear. The regional shear couple probably resulted from plate interaction and crustal thickening during the Grenville Orogeny.

MYLONITE ZONES, THRUSTS, AND TECTONICS OF THE GRENVILLE IN THE ADIRONDACKS

Nº 19883

ANDERSON, S.L., BURKE, K.C., KIDD, W.S.F., and PUTMAN, G.W., Dept. of Geological Sciences, SUNY-Albany, Albany, N.Y. 12222

Relationships between granitic and metasedimentary rocks in the Adirondacks have been explained by two models, neither of which are much concerned with the great variations in strain evident in the rocks: intrusion of sills, or a folded basement-cover assemblage. In the latter, huge isoclinal folds have been postulated and used to explain layer-parallel foliation and small-scale isoclinal folds. We suggest that, as in the Alps and Himalayas, such nappes are better viewed as thrust slices. The foliation is most intense in discrete zones parallel with large-scale lithologic layering; these high-strain zones contain much mylonite and at least one contains pseudotachylite. One in the south-central Adirondacks, the Sacandaga "Formation" of McLelland, is an extensive, mylonitic high strain zone containing interleaved metapelitic and mafic rocks. Before reorientation by major folds, it was regionally gently dipping. We suggest that it is a major thrust; a strong E-W elongation lineation widespread in the southern Adirondacks gives the movement direction. Other major, originally gently inclined mylonitic zones exist elsewhere in the Adirondacks and we also identify them as significant thrusts. Without younging or fossil evidence it is difficult to show that a deformed lithologic succession is a depositional sequence and major thrusts make it improbable that more than partial depositional sequences are present. Wilson-cycle interpretation of Grenville tectonics permits a major continental collision to explain the thrusts and later folding (Himalayas) but more complex models including earlier tectonics along an active convergent margin (e.g. Tibet) are perhaps more probable.

PRECAMBRIAN GEOLOGY: APPALACHIAN GRENVILLE TERRANES
Doric Room, The Concord Resort Hotel, 1340 hours

Douglas Mose and Philip Whitney, Presiding

1 **Stewart S. Farrar*, Lynn Glover III:** GRENVILLE BASEMENT IN THE PIEDMONT EAST OF THE PRE-APPALACHIAN (PRE-CALEDONIAN) EDGE (?) OF THE NORTH AMERICAN CRATON [20502] 1340

2 **Robert D. Hatcher, Jr.*, Teunis Heyn, Keith I. McConnell, Stephen C. Godfrey:** PRELIMINARY RESULTS OF A DETAILED STUDY OF PART OF THE SAURATOWN MOUNTAINS BASEMENT MASSIF, NORTH CAROLINA [20504] 1400

3 **Douglas G. Mose*, Susan Nagel, Richard J. Jackson, Ahmet Tunsoy:** EVIDENCE AGAINST PRE-GRENVILLE METAMORPHISM IN THE READING PRONG OF SOUTHEASTERN NEW YORK [21005] 1420

4 **Philip R. Whitney*:** A THREE-STAGE MODEL OF ADIRONDACK TECTONIC HISTORY [14266] 1440

5 **James McLelland*:** LINEATIONS, SHEATH FOLDS, AND IMPLICATIONS FOR ADIRONDACK TECTONIC HISTORY [17326] 1500

6 **S.L. Anderson*, K.C. Burke, W.S.F. Kidd, G.W. Putman:** MYLONITE ZONES, THRUSTS, AND TECTONICS OF THE GRENVILLE IN THE ADIRONDACKS [19883] 1520

COFFEE BREAK 1540

7 **H.X. Willems*, W. Bosworth, G.W. Putman:** EVIDENCE FOR COMPLEX STRAIN HISTORY OF THE MCGREGOR FAULT, EASTERN ADIRONDACKS: A POSSIBLE REACTIVATED LATE PRE-CAMBRIAN RIFT STRUCTURE [13715] 1600

8 **William D. Romey*, William T. Elberty, Jr.:** BRITTLE DEFORMATION AND METAMORPHISM OF POST-GRENVILLIAN SANDSTONE, ADIRONDACK LOWLANDS [13703] 1620

9 **O.H. Muller*, W.H. Diment, T.C. Urban:** THE GEOPHYSICAL NATURE OF THE ADIRONDACK MOUNTAIN BLOCK: RELATION TO SEISMICITY [24616] 1640

10 **Donald S. Miller*, Stephen Lakatos:** THE UPLIFT HISTORY OF THE ADIRONDACK METANORTHOSITE [13717] 1700

QUATERNARY GEOLOGY: GLACIAL STRATIGRAPHY AND PROCESSES
Spartan/Athenian Rooms, The Concord Resort Hotel, 1340 hours

Robert F. Black and Parker Calkin, Presiding

1 **Thomas Brewer*, Andrew N. Genes, William A. Newman:** THE EVIDENCE FOR PRE-LATE WISCONSINAN TILL IN THE ST. JOHN RIVER VALLEY, NORTHERN ME. [26804] 1340

2 **P. Thompson Davis*:** GLACIAL SEQUENCE, MT. KATAHDIN, NORTH-CENTRAL MAINE [24416] 1400

3 **D.W. Caldwell*, Richard S. Pratt:** THE WISCONSIN STRATIGRAPHY OF THE NEW SHARON SITE, MAINE [15043] 1420

4 **J.P. Schafer*, Janet R. Stone:** STAGNATION ZONE RETREAT OF THE LAST ICE SHEET IN CONNECTICUT [25940] 1440

5 **Matthew Gubitosa*:** TILL AND OUTWASH SEDIMENTS IN THE EAST BRANCH VALLEY, HANCOCK AREA, NEW YORK [22027] 1500

6 **Robert F. Black*:** CLASTIC DIKES OF BASAL TILL, SOUTHERN CONNECTICUT, ATTRIBUTED TO THICK STAGNANT ICE [19915] 1520

7 **James E. Baxter*, Thomas W. Gardner, George H. Crowl:** PRE-WISCONSINAN GLACIATION IN THE WEST BRANCH OF THE SUSQUEHANNA VALLEY, CENTRAL PENNSYLVANIA [19806] 1540

8 **Robert B. Jacobson*:** SEDIMENTATION IN A SMALL ARM OF PROGLACIAL LAKE MONONGAHELA, BUFFALO CREEK, WEST VIRGINIA [13369] 1600

9 **Byron D. Stone*, Eric R. Force:** COARSE-GRAINED GLACIOLACUSTRINE DELTAIC SEDIMENTATION IN ICE-MARGINAL AND ICE-CHANNEL ENVIRONMENTS [20417] 1620

10 **L.A. Haworth*, P.E. Calkin, Beth Lamb, J.M. Ellis:** A NEOGLACIAL SEQUENCE FOR THE WEST CENTRAL BROOKS RANGE, ALASKA [13733] 1640

11 **J.C. Dionne*, C. Laverdière, P. Guimont:** DRIFT ICE ABRASION MARKS ALONG ROCKY SHORES, HUDSON BAY, CANADA [21334] 1700

12 **M. Bell*, E.P. Laine:** THE DENUDATION OF GLACIATED CONTINENTS [17691] 1720

SEDIMENTOLOGY
Corinthian Room, The Concord Resort Hotel, 1340 hours

John Hubert and James M. Parks, Presiding

1 **Paul M. Myrow*:** SEDIMENTOLOGY OF THE CHESHIRE FORMATION IN WEST CENTRAL VERMONT [13852] 1340

2 **Guy J. Gregory*, Charlotte Mehrtens:** PALEOENVIRONMENTAL RECONSTRUCTION OF THE DUNHAM DOLOMITE (LOWER CAMBRIAN), NORTHWESTERN VERMONT [18352] 1400

3 **Robert A. Welsh, Jr.*, Harold B. Rollins:** DEPOSINAL ENVIRONMENT OF THE ORISKANY SANDSTONE (LOWER DEVONIAN) IN SOMERSET COUNTY, PENNSYLVANIA [15257] 1420

4 **G. Sarwar*, J.P. Smoot:** DEPOSITIONAL MODEL FOR THE MIDDLE DEVONIAN MOHANTANGO FORMATION OF SOUTH-CENTRAL PENNSYLVANIA [21649] 1440

5 **Robert A. Gallagher*, James M. Parks:** DEPOSITIONAL ENVIRONMENTS OF THE LOYALHANNA MEMBER OF THE MAUCH CHUNK FORMATION, NORTH-CENTRAL PENNSYLVANIA [19451] 1500

COFFEE BREAK 1520

6 **Richard H. Lindemann*:** A PROPOSED LOCAL SOURCE OF GRAVEL IN THE POTSDAM FORMATION (UPPER CAMBRIAN) IN SARATOGA COUNTY, NEW YORK [13745] 1540

7 **Gary G. Lash*:** SILT TURBIDITES OF THE MARTINSBURG FORMATION - SEDIMENTOLOGY AND POSSIBLE SIGNIFICANCE [13796] 1600

8 **James M. Parks*:** EIGENSHAPE ANALYSIS OF UNCONSOLIDATED SANDSTONES FROM NEW JERSEY AND LITHIFIED SANDSTONES FROM PENNSYLVANIA [23360] 1620

9 **G.V. Middleton*, C.J. Salas, I.P. Martini:** WHIRLPOOL SANDSTONE (SILURIAN), OF SOUTHERN ONTARIO, A BRAIDED RIVER DEPOSIT? [21331] 1640

10 **John A. Diemer*:** SEDIMENTOLOGY AND PALEOHYDRAULICS OF LOWER CARBONIFEROUS COASTAL FACIES, KERRY HEAD, CO. KERRY, EIRE [13751] 1700

11 **E.S. Belt*, R.M. Flores, B.W. Rockwell, Yuan-lun Hsia, R.F. Yuretich:** DEPOSITION OF SUSPENSION LOAD VS. MIXED LOAD SEDIMENTS IN MEMBERS OF THE FORT UNION FORMATION (PALEOCENE), NE POWDER RIVER BASIN, MONTANA [14041] 1720

REGIONAL STRUCTURE AND TECTONICS I: GENERAL
Little Club, The Concord Resort Hotel, 1340 hours

Ina B. Alterman and Michael J. Hozik, Presiding

1 **Joseph A. Dipietro*:** TECTONIC RELATIONS IN THE PINNACLE-UNDERHILL FORMATIONS IN CENTRAL VERMONT [13855] 1340

2 **Virginia L. Peterson*:** MULTIPLE DEFORMATION OF SILURO-DEVONIAN STRATA, ASHBURNHAM-ASHBY AREA, NORTH-CENTRAL MASSACHUSETTS [14042] 1400

3 **M.P. Dickenson*:** THE NORTHY HILL THRUST FAULT: A NEW LOOK [15071] 1420

4 **J.W. Skehan*, Nicholas Rast:** STRUCTURAL GEOLOGY OF LATE PRECAMBRIAN ROCKS, SOUTHERN NARRAGANSETT BAY, RHODE ISLAND [24556] 1440

COFFEE BREAK 1500

5 **RaNaye B. Dreier*:** THE BLACKSTONE SERIES: EVIDENCE FOR AVALONIAN TECTONICS IN NORTHERN RHODE ISLAND [21360] 1520

6 **M. Cornelia Henderson*, Sharon Mosher:** NARRAGANSETT BASIN, RI: ROLE OF INTRABASINAL HORSTS AND GRABENS IN ALLEGHANIAN DEFORMATION [17801] 1540

7 **Alan W. Berryhill*, Sharon Mosher:** FAULT-RELATED POLYPHASE DEFORMATION ON DUTCH ISLAND, RHODE ISLAND [20301] 1600

8 **Kieran O'Hara*:** DUCTILE DEFORMATION IN AVALONIAN GNEISSES, NW RHODE ISLAND/NE CONNECTICUT AND ITS RELATIONSHIP TO THE LAKE CHAR FAULT [15067] 1620

9 **Paul V. Smith*, Patrick J. Barosh:** DETAILED STRUCTURE OF A SMALL SEGMENT OF THE BLOODY BLUFF FAULT ZONE IN THE CONCORD QUADRANGLE, MASSACHUSETTS [15038] 1640

10 **Ina B. Alterman*:** THE COVINGTON-CLIFTON FORGE FAULT: MORE EVIDENCE FOR POST-FOLDING ROTATION OF THE SOUTHERN APPALACHIANS [24950] 1700

ABSTRACTS with PROGRAMS 1983

18th Annual Meeting

NORTHEASTERN SECTION

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