33-9 BTH 9 Blood, David R.

FRAMBOID SIZE DISTRIBUTION IN BLACK SHALE OF THE UPPER DEVONIAN HANOVER SHALE, WESTERN NEW YORK: EVIDENCE FOR FLUCTUATIONS IN THE REDOX BOUNDARY

BLOOD, David R. and LASH, Gary G., Department of Geosciences, SUNY Fredonia, Fredonia, NY 14063, Lash@fredonia.edu

The Upper Devonian (Frasnian) Hanover shale comprises several intervals of interbedded gray and black shale. We conducted a microfabric analysis of a sequence of four black shale beds (12 to 16 cm thick) and interbedded gray shale (32 to 62 cm thick) roughly 2 m above the Hanover shale-Pipe Creek shale contact near Silver Creek, New York. The organic-rich layers, though typically laminated, are bioturbated toward their contacts with overlying poorly laminated (bioturbated) gray shale. Pyrite framboids in the black shale beds occur in two modes: 1) isolated spheres and 2) polyframbroidal masses of as many as 65 component framboids. The former define a bimodal size distribution with mean sizes of 5.5 µm (+/-2.6 µm) and 25.1 µm (+/-6.9 µm). The smaller framboids probably grew within a euxinic water column and settled to the substrate; however, the larger spheres appear to have grown in the sediment. Component framboids of the polyframboids are characterized by a mean size of 7.8 µm (+/-4.4 µm). The generally large size of these framboids suggests that the polyframboids grew in situ. Indeed, microscopic observations of the polyframbroids reveal them to be completely wrapped by clay grains suggesting that the masses grew into water-rich flocculated sediment. We suggest that the alternating black and gray shale beds reflect repeated lowering of the redox boundary. At the outset, small framboids that had formed near the redox boundary within a euxinic water column settled to the ocean floor with flocculated organic clay. At length, the redox boundary dropped very close to the sediment-water interface resulting in the diagenetic growth of the large isolated framboids and polyframboids. The redox boundary continued its descent moving perhaps 5 to 10 cm into the sediment. This resulted in the accumulation of the gray shale in a dysoxic or oxic water column and establishment of bottom-dwelling organisms that homogenized the gray shale and burrowed into the black shale. The cycle repeated itself when the redox boundary reestablished itself in the water column.

33-10 BTH 10 Begeal, C.J.

RIPOGENUS FORMATION, NORTHERN MAINE - AGE, SEQUENCE STRATIGRAPHY, AND SIGNIFICANCE OF SYN-DEPOSITIONAL TECTONISM

BEGEAL, C.J.[1], KIDD, W.S.F.[1], SCHOONMAKER, A.[1], BRADLEY, D.[2], and HARRIS, A.[3], (1) Earth & Atmospheric Sciences, Univ at Albany, Albany, NY 12222, cb7971@albany.edu, (2) U.S. Geol Survey, 4200 University Drive, Anchorage, AK 99508, (3) US Geol Survey, 991 National Center, Reston, VA 20192

Detailed mapping reveals that a major sequence boundary (erosion surface) exists within the shallow marine strata of the Ripogenus Formation near the Ripogenus Dam in northern Maine. An orthoquartzite unit within the formation rapidly varies in thickness from 0-20 meters over distances of a few hundred meters. We infer that this rapid thickness change is due to the filling of paleotopography including significant paleorelief in the form of valleys. This erosion surface cuts into the distinctive "pitted" unit of the Ripogenus Formation, predominantly fine-grained calcareous quartz arenites, interbedded with lenticular limestone that is abundantly stromatoporoid-bearing. These lower strata of the Ripogenus Formation have yet to be paleontologically well-dated, at these exposures. A previously reported conodont-based age, of late Ludlow to early Lochovian, dates a bedded limestone member (a few meters thick) immediately overlying the orthoquartzite. An older regional study reported a possible mid-upper Llandovery age, from brachiopods, for the strata likely equivalent to the pitted arenite-limestone unit. Near the Ripogenus Dam the conodont-dated limestone is overlain by a thick (~50m) limestone breccia, which we interpret to be derived from mass wasting of post-orthoquartzite limestones, and initiated by syn-depositional normal faulting of the Ripogenus Formation. A section of ~100 meters of deeper-water mudrocks and interbedded pinstripe quartzite siltites (probable contourites), which overlies the limestone breccia, gives evidence of an event of coeval rapid subsidence. Mafic volcanics (West Branch) succeed the mudrocks and are also probably linked to the faulting and rapid subsidence we infer for the upper part of the Ripogenus Formation. This overall event sequence can be readily integrated with a model of flexural forebulge and outer foredeep normal faulting in connection with the start of the Acadian orogenic event in north-central Maine.

33-11 BTH 11 Toth, Kristin S.

THE ROLE OF CLAY MINERAL SURFACE AREA IN ORGANIC CARBON ACCUMULATION IN BLACK SHALES

TOTH, Kristin S. and RIMMER, Susan M., Univ of Kentucky, Department of Geological Sciences, 101 Slone Building, Lexington, KY 40506-0053, ktoth78@hotmail.com

Recent work on Cretaceous sediments of the Western Interior Seaway (U.S.A.) has suggested that internal surface area in smectite and mixed-layer clays plays an important role in the accumulation, burial, and preservation of organic matter (OM) in marine shales. To assess the importance of this control in organic-rich marine black shales of other ages and settings, total organic carbon (TOC), clay mineral composition, and clay mineral surface area was determined for a suite of Devonian-Mississippian black shales from the central Appalachian Basin (east-central Kentucky). External surface area was determined using the Brunauer-Emmett-Teller (BET) method, whereas the ethylene glycol monoethyl ether (EGME) method was used to determine internal surface area of clay minerals in each sample. Major and trace-element data, along with organic petrographic and Rock Eval data, were available for comparison from a previous study.

TOC contents for the Devonian-Mississippian shales range from less than 1% to more than 21%. X-ray diffraction analysis indicates a predominance of illite and mixed-layer illite-smectite (I-S) clays. Shales containing a higher percentage of mixed-layer I-S clays have slightly higher internal surface areas and TOC contents, but relationships are much weaker than those shown previously for Cretaceous samples. In agreement with previous work, external surface area does not show a significant correlation with organic carbon content. Surface-area measurements for a subset of samples subjected to low-temperature ashing (to remove the organics) suggest no significant OM contribution to internal surface area. These preliminary data suggest that mineral surface area may have been a contributing factor in the preservation of OM in the Late Devonian and Early Mississippian, but it was probably just one factor among many (including preservation of OM under anoxic conditions and productivity).

These results will be compared to those for Pennsylvanian gray and black shales from the Illinois Basin (western Kentucky) and Cretaceous shales from the Western Interior Seaway to evaluate the relative importance of clay mineral type and internal surface area in the accumulation of OM in marine environments.

33-12 BTH 12 Cooper, John K.

DEPOSITIONAL ENVIRONMENTS OF THE STE. GENEVIEVE LIMESTONE, UPPER MISSISSIPPIAN, S.W. VIRGINIA

COOPER, John K., East Carolina Univ, Dept Geology, Greenville, NC 27858-4353, jkc0515@mail.ecu.edu.

The Upper Mississippian Ste. Genevieve Limestone crops out along the flanks of the Powell Valley Anticline in Wise and Lee Counties, Virginia, and is composed of several shallowing upward cycles. These shallowing upward cycles of the Ste. Genevieve in this region contain four facies associations: shoal, intershoal, restricted/backshoal and open ramp/foreshoal. The shoal facies, which is dominant in the Ste. Genevieve, is composed of oolitic grainstone and has an average ooid content of 40%. The intershoal facies (12% average ooid content) is mainly composed of ooid packstones and minor skeletal packstones. Lithologies representing deposition in low energy areas of the backshoal/restricted facies range from skeletal wackestones to dolomitized mudstone, with no ooids and moderate amounts of quartz silt. The open ramp/foreshoal facies, represented by skeletal grainstones and minor skeletal packstones with an average of °Ô 6% ooid content, occurs only at the base of the unit. These facies suggest deposition on a broad, shallow, distally steepened ramp, punctuated by shoaling oolite bodies and restricted lower energy environments. This marks the transition from shallow water sedimentation of mainly oolitic compositions to the west, to deeper water carbonates to the east.

33-13 BTH 13 Frye, Kristen Ann

FORAMINIFERS IN THE STE. GENEVIEVE LIMESTONE, GREENDALE SYNCLINE, VIRGINIA

FRYE, Kristen Ann, Geology, East Carolina Univ, 1302 E. 14th St. Apt. 1D, Greenville, NC 27858, kaf0304@mail.ecu.edu and NEAL, Donald, Geology, ECU, Graham Building, East Carolina University, Greenville, NC 27858

The Mississippian Ste. Genevieve Limestone in the Greendale syncline, Washington County, Virginia, is a thick accumulation of carbonate and mixed carbonate-siliciclastic sediment deposited in a trough along the incipient Appalachain orogen. Foraminifers are observed in all sediment types with more robust forms predominant in the coarser grainstones at the base of the section. Foraminifers in the mixed-carbonate siliciclastic sediments are smaller and of lower diversity. The majority of the foraminifers observed are of the endothyrid affinity.

33-14 BTH 14 Chesnut, Donald R.

HELL FOR CERTAIN—A CARBONIFEROUS VOLCANIC ASH IN THE EASTERN USA

CHESNUT, Donald R. Jr, Kentucky Geol Survey, 228 MMRB, University of Kentucky, Lexington, KY 40506-0107, chesnut@kgs.mm.uky.edu.

The Hell For Certain flint clay bed or tonstein is a new name for the flint clay parting of the Fire Clay coal and the coal's lateral equivalents in the central Appalachian basin. The bed has been mapped in Tennessee, Kentucky, Virginia and West Virginia where it was known as "the flint clay parting" or the "jackrock parting" of the coal. The coal name changes from valley-to-valley or county-to-county, but the names are widely recognized to represent the same coal bed and the flint clay, the same flint clay bed. In practice, the bed is a key stratigraphic horizon used in all these states. "Jackrock" is a mining term and refers to the suitability of the hard flint clay as a floor for mining jacks and other roof support systems.

Numerous researchers in the last two decades have reached the consensus that the widespread bed is an altered volcanic ash, most of the ash altering to kaolinite in the mire environment. The suite of included volcanic minerals and the lack of common resistate sedimentary minerals has been used, among other observations, to support a volcanic origin. Sanidine in the tonstein has been dated by several laboratories and all provide an Ar/Ar date of 311-312 ma, the only confirmed radiometric date for Carboniferous strata in the basin.

The Hell For Certain flint clay or tonstein takes its name from Hell For Certain Creek in northern Leslie County, Kentucky. The Fire Clay (Hazard No. 4) coal was extensively mined in this area. The creek is located in the northern part of the Hyden West 7.5-minute Quadrangle. Outcrops have now been overgrown and access is limited, the creek being the only road in many places. A nearby reference section is a roadcut at mile-marker 40 on the Daniel Boone Parkway reported in Cobb et al, 1981. The name Hell For Certain is appropriate because conditions must have been very difficult during the heavy ash fall.

SESSION NO. 34, 8:00 AM

Friday, March 26, 2004

Sedimentation and Stratigraphy II (Posters)

Hilton McLean Tysons Corner, Ballrooms A and B

34-1 BTH 15 Wizevich, Michael C.

DEPOSITIONAL PROCESSES AND STRATIGRAPHY OF ALLUVIAL DEPOSITS IN THE JURASSIC PORTLAND FORMATION, CONNECTICUT

WIZEVICH, Michael C., Department of Geology, Northeastern Univ, 14 Holmes Hall, Boston, MA 06515, m.wizevich@neu.edu and DRZEWIECKI, Peter A., Environmental Earth Sciences Department, Eastern Connecticut State Univ, 83 Windham Street, Willimantic, CT 06226

The upper Portland Formation contains thick packages of amalgamated sandstone and conglomerate beds that have traditionally been interpreted as alluvial fan and braided stream deposits laid down along the edge (Eastern Border Fault) of the Hartford Rift Basin. Examination of new outcrops revealed four lithofacies that reflect deposition under a range of flow conditions. These facies are vertically stacked into cycles that reflect a combination of autocyclic and allocyclic (tectonic and climatic) depositional controls.

Facies are: 1) plane-bedded conglomeratic sandstone, 2) trough cross-bedded conglomeratic sandstone, 3) massive sandstone, and 4) siltstone. The plane-bedded facies and trough cross-bedded facies both consist of medium- to coarse-grained sandstone in beds (0.5 to 2 m thick) that typically have discontinuous conglomeratic lenses at their bases. Bedding surfaces are low-relief, but can have small, shallow channels. These facies are interpreted to represent sand bars deposited during periods of high flow rates in braided streams. The nature of cross-bedding (plane-bedding or trough cross-bedding) most likely reflects varying flow conditions or deposition in different locations along a channel bar. The massive facies is medium- to coarse-grained sandstone beds (1 to 2 m thick) with isolated gravel and cobbles . Massive beds are interpreted as hyperconcentrated flow deposits from periods of high flow rates and rapid deposition in braided stream channels. The siltstone facies occurs in thin beds (typically less than 20 cm), and is interpreted to represent deposition under reduced flow velocities, probably in floodplains.

unconformity. The dominant, central interval consists of organic-rich sediments deposited in a true GRS environment. Oriented microtome sections indicate a wide range of constituents including charcoal, fungal spores, pollen, macrophyte tissue, cell fillings, fecal pellets, and humified matrix. Systematic changes in these parameters indicate a number of paleoenvironmental changes. LOI data confirm wt% organic matter contents ranging from 20 to 80%. The basal age of this interval is > 3. 5 ka, consistent with a 4-6 ka rise in the regional groundwater table. The uppermost interval (20 cm), which reflects environmental conditions during historic and modern times, consists of inorganic-rich sediments. These sediments likely represent an oxidized weathering residue related to a drop in the groundwater table caused by the 1930 emplacement of the Saluda dam, but could also represent colluvium related to erosion caused by historical land use patterns. Further research on these systems is relevant to a refined (re)assessment of the ecology, function, and/or stratigraphy of floodplain margins as well as management of analogous systems, both modern and ancient.

31-8 3:40 PM Raber, Maverick J.

CHARACTERISTICS OF SEDIMENTS TRANSPORTED AND DEPOSITED IN THE CAPE FEAR RIVER ESTUARY, SOUTHEASTERN NORTH CAROLINA

RABER, Maverick J., BENEDETTI, Michael M., SMITH, Michael S., and LEONARD, Lynn L., Department of Earth Sciences, Univ of North Carolina at Wilmington, 601 S. College Rd, Wilmington, NC 28403-5944, mjr4527@uncw.edu

The objectives of this study are to characterize the mineralogy and textural attributes of alluvial sediments throughout the Cape Fear River Basin and to determine if sediments recently deposited in the lower watershed were derived from the upper watershed. Sediment is delivered to the estuary from the Piedmont-draining main stem Cape Fear River (brownwater stream) and the Coastal Plain draining Black and Northeast Cape Fear Rivers (blackwater streams). Total suspended solid (TSS) concentrations in the Cape Fear River are 2 to 4 times greater than in the blackwater streams suggesting that little particulate matter enters the estuary from the blackwater systems. Mineralogical analyses, including point counts of sand-sized overbank alluvium and x-ray diffraction of clay-sized overbank alluvium, show a diverse mineral suite (e.g. illite, feldspar) in the brownwater system and a mineral suite consisting primarily of highly weathered minerals (e.g. vermiculite, kaolinite) in the blackwater system. In the downstream direction of the brownwater system, there is a reduction in weatherable minerals and an increase in the proportion of quartz. Grain size distributions of overbank alluvium do not vary in a predicable fashion. The results of this project are relevant to the management of coastal waters fed by Piedmont and Coastal Plain draining rivers of the Atlantic drainage.

31-9 4:00 PM Moore, Matthew S.

ASSESSING LONG-TERM CHANGES TO GIANT SAND WAVES IN EASTERN LONG ISLAND SOUND, U.S.A

MOORE, Matthew S.[1], FENSTER, Michael S.[1], and FITZGERALD, Duncan M.[2], (1) Environmental Studies, Randolph-Macon College, Ashland, VA 23005, mmoore@rmc.edu, (2) Earth Sciences, Boston Univ, 675 Commonwealth Avenue, Boston, MA 02215

We used Arc8 Geographic Information Systems (GIS) software to produce imagery of and quantify 16 years of changes to a 1 km^2 region within a giant sand wave field in the eastern Long Island Sound estuary. Despite the previously reported stability of these large sand waves (Ht ≤ 17 m) over a 7 month period in 1987 (Fenster *et al.*, 1990), the bedform asymmetry, nature of the surficial material, *in situ* submersible observations, and hydraulics suggest that these bedforms reside in a zone of long-term active sediment transport. We tested this hypothesis by producing a highly accurate, digital bathymetric map in June 2003 and comparing this map to two highly accurate, digital bathymetric maps dating to May and December, 1987. Arc8 provided an extraordinary tool for visualizing and analyzing volumetric, morphologic, and planimetric changes to the sand wave field. The results show migration into the estuary (southwest) at an average rate of 2.5 m/yr +/- 0.45 m for the 17 year period and a net migration distance across the sand wave field of 38.4 m +/- 6.4 m over the same period. In addition, the southern flanks of the bedforms migrated at faster rates than other portions of the bedforms. This differential migration along individual sand waves resulted in an overall westerly rotation in orientation and bedform coalescing. Volume estimates obtained at 5 m depth datum increments ranging from 55 m to 35 m showed an exponential reduction in surface area at all three survey dates as the depth decreases. We are currently determining if a power function equation generated from these data is capable of predicting volume changes at various locations across individual bedforms. Finally, cut and fill analyses produced maps revealing the areas of sediment losses (erosion primarily along the stoss slopes) and sediment gains (deposition along active slip faces).

31-10 4:20 PM Cervone, Edmund J.

THE ECONOMICS OF FEDERAL NAVIGATION PROJECTS: TWO CASES IN SOUTHERN COASTAL MAINE

CERVONE, Edmund J., Delaware Coastal Mgnt Program, 5 E Reed St, Suite 201, Dover, DE 19901, ed.cervone@state.de.us.

Economic, engineering, and political factors jointly determine the success or failure of publicly funded inlet stabilization projects. Of these three factors, economics are critical in determining whether projects are undertaken at all, and therefore deserve special consideration. Federal authorization requires that the predicted economic benefit of a project exceed its cost, meaning a benefit to cost ratio greater than one. Once a project has begun, it is difficult to stop, so accurate economic projections are very important. Projects authorized with a benefit to cost ratio close to one risk generating economic losses over their lifetime due to the uncertainty of dynamic coastal settings. Case study analysis detailing the economic histories of the Webhannet River Project in Wells, Maine, and the Saco River Project in Saco, Maine, highlights common patterns responsible for problems faced by these types of projects. Both cases were based on low net-benefit projections. A comparison of historical U.S. Army Corps benefit and cost projections with current numbers reveals that those benefits were never realized. Unanticipated engineering problems required several alterations to the project designs, driving up costs. Attempts to generate greater benefits by increasing the size and scope of the projects resulted in even greater expense. Indirect costs accrued over time from loss of homes and habitat on adjacent land due to the presence of jetties. The full projected benefits of these projects were never realized due to unanticipated socioeconomic factors and failures to deliver functioning structures as originally designed. In the short term, these case studies reinforce the need for accurate economic data, including non-market values of natural resources, on which to base informed decisions. They also reveal that a benefit to cost requirement of just greater than one leaves little room for error; a higher threshold is needed. In the long term, planners need to address the limitations of traditional cost-benefit analyses that assume a "now or never" approach that may not accurately reflect the reality of the situation. Factors that deserve consideration include potential loss of natural assets, the uncertainty of benefits and costs, and the irreversible nature of these projects.

31-11 4:40 PM Mallinson, David J.

THE SEISMIC STRATIGRAPHIC FRAMEWORK OF EASTERN PAMLICO SOUND, NORTH CAROLINA: IMPLICATIONS FOR ANTECEDENT CONTROLS ON COASTAL GEOMORPHOLOGY

MALLINSON, David J.[1], RIGGS, Stanley[2], THIELER, E. Robert[3], and FOSTER, David[3], (1) Geology Dept, East Carolina Univ, Greenville, NC 27858, mallinsond@mail.ecu.edu, (2) Geology, East Carolina Univ, Greenville, NC 27858, (3) U.S. Geol Survey, Woods Hole, MA 02543

Geophysical surveys (single channel seismic and chirp sonar) conducted in the back-barrier estuarine environment of Pamlico Sound in North Carolina allow the regional geologic framework to be mapped in detail and related to the geomorphology of the modern coastal system. Within the study area, a discontinuous basal reflection marks the acoustic basement at ~100 ms (75 to 85 m below sea level) in the north, and rises to the south to a depth of ~50 ms (~37 mbsl) beneath Ocracoke Inlet. Based on correlations to boreholes in the area, this basal reflection is interpreted as the contact between Lower Pliocene and Upper Pliocene to Recent beds. Multiple Quaternary seismic sequences bounded by high amplitude reflections and exhibiting extremely complex incised channel-fill facies occur throughout the area. Based on the abundant incised channel facies, it is clear that the seismic sequence boundaries represent depositional sequence boundaries. At least 15 depositional sequences are evident in the upper 80 ms (~60 m) of data. In northern Pamlico Sound, seismic data reveal depositional sequences that dip gently southward into the Albemarle Embayment. In the central study area (between Salvo and Avon), beds are nearly horizontal. To the south, in the Cape Hatteras area, beds dip northward and are controlled by the presence of an antecedent high that is approximately 30 meters thick and 20-30 km wide. Major subsurface features include an antecedent high beneath Buxton and Hatteras; a large valley-fill complex (40 km wide by 30 m deep) beneath Salvo to Avon; several intermediate-scale (5 km wide by 15 m deep) channel complexes that appear to have been reoccupied over several successive sea-level cycles; and many small incised channels. Ocracoke and Hatteras Inlets appear to occupy fluvial channels incised to depths of at least 30 mbsl. The present location of Oregon Inlet does not appear to occupy a fluvial channel. Data indicate strong ties between the modern coastal geomorphology (cape and shoal structures and inlet locations and stability) and the antecedent geology.

SESSION NO. 32, 8:00 AM
Friday, March 26, 2004
Science and Public Policy Keynote Forum
Hilton McLean Tysons Corner, Amphitheater

Speakers Will Be from the Federal Government, Both Career Employees and Political Appointees, Congressional Staff, Nongovernmental Organizations, State Government, and the Media

SESSION NO. 33, 8:00 AM
Friday, March 26, 2004
Sedimentation and Stratigraphy I (Posters)
Hilton McLean Tysons Corner, Ballrooms A and B

33-1 BTH 1 Isphording, Wayne C.

ALTERNATIVES TO TRADITIONAL PARTICLE SIZE ANALYTICAL METHODS: A CRITICAL COMPARISON

ISPHORDING, Wayne C. and BARCLAY, Elizabeth J., Earth Sciences, Univ of South Alabama, Mobile, AL 36688, wisphord@jaguar1.usouthal.edu

Methods measuring the particle size distribution of unconsolidated sediments were first described in the late 19th Century. By early 20th Century heated debates raged championing certain procedures and denigrating others. In spite of the fact that sophisticated electronic methods have been developed over the past 25 years, several older procedures have stood the "test of time" and have endured Sieve analysis is one such method and in spite of strong criticism directed by Mitscherlich in 1905 (who pointed out that sieves sort grains not only according to size, but also according to shape), sieve analysis continues to be recognized as a viable method(ASTM D-422. Historically sieves have been used for gravel- and sand-sized particles but to obtain a "complete" distribution, the analysis must be combined with a method providing information on the silt-clay fraction. This has always been identified as a flaw in the analytical procedure because, if either a hydrometer or pipette analysis is used for the silt-clay fraction, then error is introduced because the latter methods are dependent on particle density and are predicated on an assumption of "spherical" particle morphology. The use of a sonic sifter can largely avoid this problem because precision sieves are now available that allow particle sizes to be measured to as small as 5 microns. Sieves in the sub-sand size are expensive, however, and differences were noted between results obtained using sieves to measure silt-sized particle data versus those obtained by traditional hydrometer or pipette methods. Arguments, similarly, persist as to the "accuracy" of the Boyocous (hydrometer) method versus the pipette method. Both are acceptable ASTM procedures and both, in fact, yield similar results. Many advocates of the pipette method may well be surprised to learn that the standard procedure for carrying out pipette analyses used by many geology and engineering laboratories actually produces results that are different from those obtained using the venerable precision pipette method developed by Andreason in 1929. The bottom line is simply that there is no "best" method. Even modern laser and X-ray methodologies have weaknesses and the best advice is to simply select a method, understand its weaknesses and, above all, be consistent and realize that different results may occur if different methods are used.

THE
GEOLOGICAL
SOCIETY
OF AMERICA

2004 Abstracts with Programs

Volume 36, Number 2 • March 2004 • ISSN 0016-7592

39th Annual Meeting

Northeastern Section

53rd Annual Meeting

Southeastern Section

March 25–27, 2004
Hilton McLean Tysons Corner
Washington, D.C.