DNAPL could pose risks of contamination through enhanced vertical migration of the DNAPL. Surfactant enhanced pump and treat using only solubilization requires pumping for long periods of time. The volume of the DNAPL was calculated in 1884, and specimens were described in 1944. This locality contains three species of Antediluvion. The molluscs occur near the top of the Stockton Fm (Carnian). Below the mollusc-bearing beds, the Stockton contains of trough-crossbeds grading upward to ripple laminations, medium to fine-grained sandstone with lateral accretion surfaces. The mollusc-bearing strata consist of thick-bedded mudstone to thin- to medium-bedded, very fine-grained sandstone. Overlying the mollusc-bearing beds are black shales of the basal Lockatong. The molluscs are interpreted to represent transitional environments between the underlying fluvial and overlying lacustrine depositional environments. The Little Conewango Creek locality was collected and described in 1921 and 1927, and include seven species of unoid bivalves and two species of freshwater myalnid bivalves. This locality occurs in the New Oxford Formation (Carnian). The outcrop consists discontinuous mudstone and siltstone, separating medium-scale trough-crossbedded, fine to medium-grained sandstone. The sandstone beds occur in sandbodies that are separated by lateral accretion surfaces. Bivalve fossils came from the uppermost sandbody, and co-occur with rare leaves. The mollusc-bearing strata are interpreted to have been deposited in a meandering fluvial system. Outcrops of the Gettysburg Formation (Norian) were examined in the vicinity of the town of Gettysburg. No molluscs were found. Alternating beds of shale, mudstone, siltstone and fine-grained sandstones contain mudcracks, burrow trace fossils and small blbles of gypsum. The depositional environment is interpreted to represent fluctuating hypersaline lacustrine to terrestrial facies, suggesting a playa environment.

CEMETERIES AS SOURCES OF GROUNDWATER CONTAMINANTS

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Fluids used for embalming in the 19th and early 20th centuries commonly contained mixtures of aromatic and nitrosamine compounds. We are collecting and analyzing groundwater and soil samples from a cemetery located at Hamilton College, which contains at least 68 graves from before 1910. Stratigraphy at the site is stony clay till over variably weathered shale. Water levels seasonally range from more than 2 m below ground surface to near the ground surface. Upgradient and downgradient wells have been installed near the cemetery. ICP-MS will be used for groundwater analysis for arsenic and lead. Future work will include aquifer characterization, clay mineralogy, and periodic sampling for metals.

THE CHAMPLAIN THRUST SYSTEM IN THE SHOREHAM-WEST-HAVEN-WHITHEAL-R REGION, WEST-CENTRAL VERMONT-EASTERN NEW YORK


New geologic maps provide evidence for continuation of the Champlain thrust system through the Shoreham-Whiting and West Haven areas of west-central Vermont, and beyond, to the Whitehall N.Y. region. The thrust, which transports the Cambrian through Ordovician shelf sequences, must split into several branches and climb in stratigraphic level near Middlebury, rather than the approach used by previous models. This, much of the displacement along the Champlain thrust is transferred to at least four significant fault branches in the vicinity of Middlebury and Orwell. This conclusion is required by outcrop scale structures and the presence and repetition of Potsdam/Danby and overlying Beekmantown Group equivalents throughout the "Shoreham duplex structure", the overall structural concept being first proposed by P. Washington (1985). Evidence for the continuity of the Champlain thrust system from the requirement of a large displacement (80-120km) on it were first given by Rowley (1982). Southwest of Orwell, to near Whitehall, imbricated limestone - black shale thrust slices near the Taconic allochthon's western boundary show that here, the eastern branches of the Champlain thrust system must climb further in stratigraphic level. In this region the westernmost branches of the Champlain thrust system, within the shelf rocks, are only intermittently traceable, because they are cut by an east-side down normal fault with at least several hundred meters of throw, traceable for 45km from Orwell to North Granville. This normal fault may be in part a low-angled thrust fault, but it is not well-constrained, and could be anywhere in Late Taconic. Pre-thrusting normal faults (of foreland basin outer slope flexural origin) can be demonstrated to control abrupt changes in the stratigraphic level of detachment of thrusts. We propose that such faults are the primary cause of the abrupt changes in detachment level in time and around the Shoreham duplexes, and of the southward disappearance of Cumberland Head-Stony Point calcareous shale facies under the Champlain thrust near Benson.

DEPOSITIONAL ENVIRONMENTS OF BIVALVE-BEARING STRATA OF THE NEWARK SUPERGROUP BASINS OF PENNSYLVANIA

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Two bivalve localities have been collected from the Newark Supergroup of Pennsylvania: Black Rock Tunnel in Phoenixville (western Newark Basin), and Little Conewango Creek near Manchester (eastern Gettysburg Basin). These localities were visited in order to collect observations of the depositional environments. Outcrops in the vicinity of Gettysburg were also examined.

40Ar/39Ar Geochronology of the Siluro-Devonian Goshen Formation, Western Massachusetts

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Southwestern New England has been subjected to three major orogenic events, the Taconian, Acadian, and Alleghanian, each with a complex metamorphic and deformation record. By using laser 40Ar/39Ar ages from muscovite, the tectothermal history of these events can be examined. Ordovician through Permian cooling ages for white micas from pre-Devonian, high-alumina schists in western New England have been obtained through previous work (Hames, Cheney, and Armstrong, 1993). Coarse muscovite crystals may retain 40Ar from previous metamorphic events, providing a series of ages identifiable with different metamorphic episodes (Hames and Hodges, 1993). The Acadian Orogeny is manifested by at least two geographically distinct metamorphic styles, an eastern (andalusite-sillimanite) type, and a western (kyanite-sillimanite) type. Each is associated with several phases of recrystallization and deformation. By focusing on the Siluro-Devonian Goshen Formation, we hope to constrain the tectothermalochoric and section metamorphic character of this western New England event. This will provide a baseline for studying metamorphosed and deformed portions of the terrane that have been effected by more than one orogenic event.

Samples of pelites were collected from the Goshen Formation along both north-south and east-west transects. Metamorphic grade ranges from garnet zone in the north to sillimanite zone in the southeast. These pelites have textures indicative of compaction P-T paths. For example, porphyroblasts of staurolite, alunooisocce, biotite, garnet, and muscovite cross-cut a pervasive crenulation cleavage in the matrix, composed of significantly smaller grains of biotite, muscovite, and quartz. Fibrolite and kyanite occur together in high grade rocks, and in lower grade rocks both garnet and staurolite are systematically pseudomorphed by chlorite. Laser 40Ar/39Ar age dates for white micas in samples of varying metamorphic grade and textural habit are being obtained to better constrain the intricacies of this western Acadian metamorphism and subsequent cooling.
SESSION NO. 28

SYMPOSIUM 2—TOWARD A NEW GENERATION OF SEISMIC HAZARD MAPS AND ENGINEERING IMPLICATIONS FOR NORTH AMERICA

Hyatt Regency, Grand Ballroom A, 8:00 AM
K. Jacob and A. Dargush, Presiding

8:00 AM Kimball, J. K.*, Hunt, R. J., Nordenson, G. J. P.: BUILDING SEISMIC SAFETY COUNCIL PROJECT ’97 [11997]


8:40 AM Jacob, Klaus H.*, Armbruster, John: FROM MAPPED SEISMIC HAZARDS ON REFERENCE GROUND CONDITIONS TO DESIGN MOTIONS ON ACTUAL SITES: OPTIONS AND CODE ISSUES [38876]

9:00 AM Power, Maurice S.*, Buckle, Ian: NATIONAL SEISMIC HAZARD REPRESENTATION ISSUES FOR THE DESIGN OF HIGHWAY AND BRIDGE STRUCTURES [2277]

9:20 AM Hough, Susan E.*: LONG-TERM SEISMIC HAZARD EVALUATION IN NORTHEASTERN NORTH AMERICA: LESSONS FROM CALIFORNIA? [38868]


10:00 AM Wheeler, Russell L*: EARTHQUAKE DEPTHS AND TECTONIC SETTINGS IN THE NORTHEASTERN UNITED STATES AND CANADA [1834]

10:20 AM Daly, Julia F.*, Sayer, Suzanne: BRIEF HISTORY OF SEISMICITY IN DELAWARE [38874]

1996 ABSTRACTS WITH PROGRAMS

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