



## Association of Environmental and Engineering Geologists

New York - Philadelphia Section

### 2013 FIELD TRIP

#### EXTENSIONAL FAULT ZONES IN THE NEWARK BASIN, NJ

Sunday, June 9<sup>th</sup>, 2013

11:30 am to 4:30 pm



*Shear fabric within Orange Mt. basalt in the Flemington fault zone.*

Field Trip Leader: Gregory Herman, PhD

New Jersey Geological & Water Survey

Field Trip Highlights: The lower contact of the Orange Mt. basalt and contact metamorphism along the Hopewell and Flemington Faults, interconnecting splay faults, and mineralized vein sets and slickensides in fault shear zones, plus explosion breccias, fossilized mudcracks and hydrothermal copper mineralization.

## Logistics and Reservations:

### Itinerary:

- 11:30-12:30** Assemble by 11:30 at Howell Living History Farm, 70 Woodens Lane, Lambertville, NJ. Sign AEG Release Forms. Introduction to regional and local geology presented during lunch (provided) at picnic area.
- 12:30-2:00** Stop 1: Walk along Moore's Creek to compare brittle strain features in the foot wall and hanging wall of the Hopewell fault. Note the differences in how extension fractures and small faults occur in gray argillite of the Lockatong Formation in contrast with sheared and polished red beds of the Passaic Formation in the collapsed hanging wall. Excellent primary sedimentary features occur in the Lockatong.
- 2:00-2:45** Travel to Mine Brook Park, Capner Street in Flemington NJ (in reduced number of cars due to limited parking)
- 2:45-4:00** Stop 2: Walk along Dolores Morales Nature Trail to observe the Orange Mt. basalt flows atop Passaic Fm. Red beds that are cut by a splay fault in the Flemington fault zone. This stop includes including hornfels, copper carbonate mineralization, and limestone-cemented basalt breccia.
- Continue down the path to the Flemington fault, will again see Lockatong argillite in the footwall and Passaic red beds in the hanging wall along a major fault. Convene at Mine Brook park pavilion to wrap up, before returning to Hopewell.
- 4:00-4:30** Return to Howell Farms by 4:30 when they close to retrieve our cars.
- Gear:** Some stream hiking---bring water proof boots, or walking shoes, change of socks recommended.
- Lunch:** Box lunch provided  
(note selections on reservation form.)
- Cost:** \$25/\$35 per person, inclusive  
Pay by check in advance, no sign ups at the door.
- Special Student Price of \$15 – Students must register in advance.
- Attendance:** Attendance limited to the first 50 people to register. Preference will be given to AEG Members.

**Reservations:**

Registration form and payment must be received by Tuesday, June 4, 2013.

Please mail attached registration and AEG Liability Waiver form with check made out to:

AEG

and mail to:

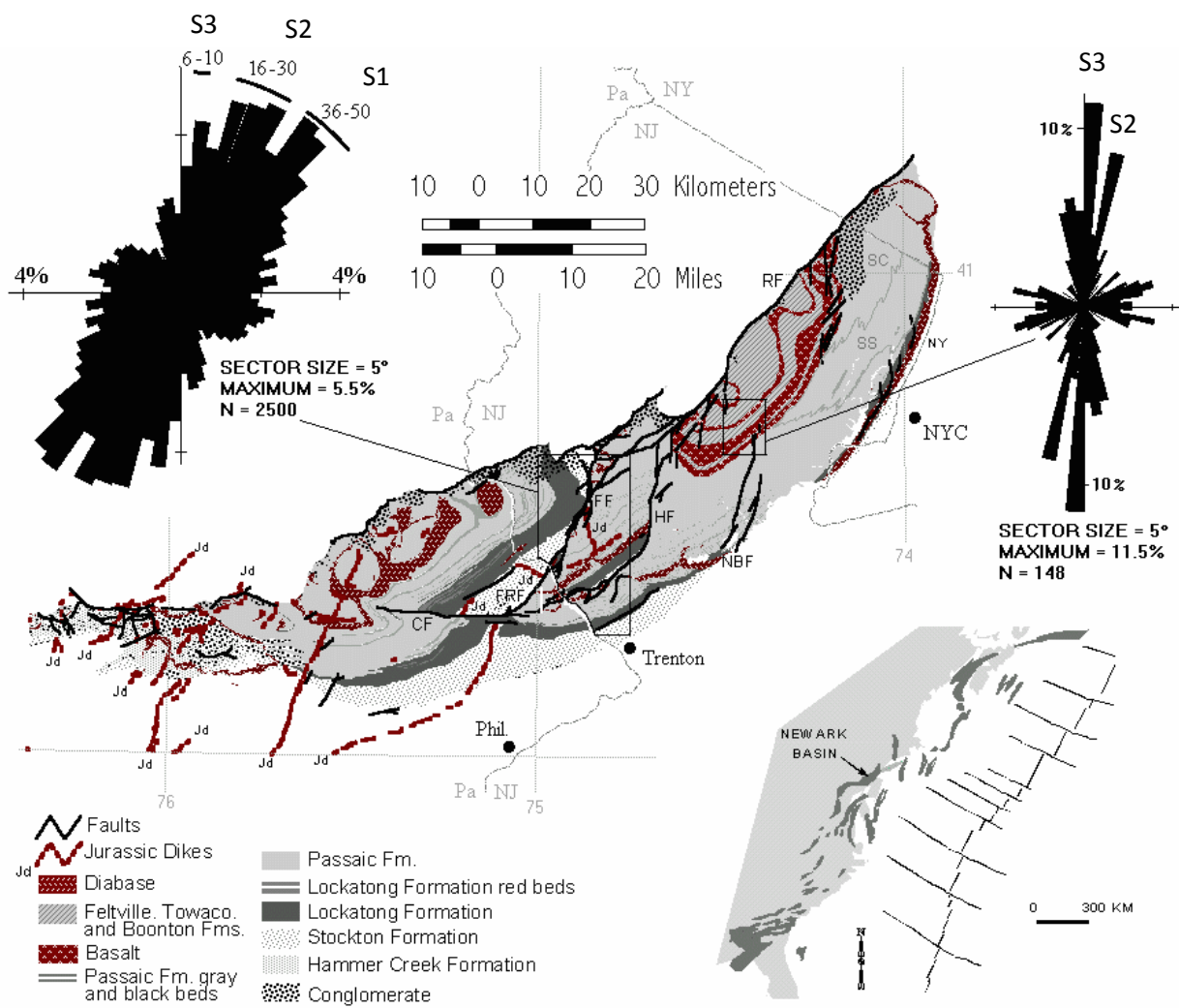
AEG Treasurer  
Curt Schmidt  
612 Hayward Street,  
Bound Brook, NJ 08805

**CECs:**

Certificates for three Professional Development Hours (pdhs) for continuing education credit will be provided, after the trip.

**QUESTIONS:**

Contact AEG Section Chairman Loren Lasky at  
(609) 558-2483 or [lorenlasky@verizon.net](mailto:lorenlasky@verizon.net)



*Map of the Newark basin showing fracture diagrams from the center and NE parts*

#### ABOUT THE PRESENTATION:

The purpose of this field trip is to examine stratigraphic, structural, and tectonic relationships of Triassic- to Early-Jurassic bedrock along two of the largest intrabasinal faults in the center of the Newark basin. These faults have 4 to 6 km dip slip and an undetermined amount of strike-slip motion.

We will spend about 2 hours each at two different locations, the first at the Hopewell Fault in the Lambertville 7-1/2' quadrangle and Hopewell Twp., Mercer County, and the second at the Flemington Fault in the Pittstown 7-1/2' quadrangle in Flemington, Hunterdon County. Both stops are located along shallow stream beds so remember to wear boots and a change of socks for afterwards, just in case. A Google Earth KMZ file showing field stations at the two locations is available at:

[http://www.impacttectonics.org/gcherman/downloads/GEO310/12A-GEO310\\_FT4.kmz](http://www.impacttectonics.org/gcherman/downloads/GEO310/12A-GEO310_FT4.kmz) (1.7 MB)

In both cases, rocks at the main fault are exposed along with a slew of adjacent, smaller, branching and interconnecting splay faults, and mineralized vein sets that interplay with systematic geometry. A manuscript that explains this geometry is available at:

[http://www.impacttectonics.org/gcherman/downloads/JSG\\_extension\\_fractures.pdf](http://www.impacttectonics.org/gcherman/downloads/JSG_extension_fractures.pdf) (5 MB)

The first location will be on the Hopewell fault along a tributary to Moore's Creek where the Lockatong Formation is exposed in the footwall for tens of meters and shows diminishing strain in the direction away from the main fault. But smaller faults occur within the footwall block in a 'process zone' where fault growth was happening but became arrested before the block was incorporated as a fault slice. The hanging wall here has crushed and mineralized Passaic red beds showing slickensided, polished shear surfaces and sub-horizontal extension veins that reflect collapse and shearing of the hanging wall during normal dip slip and subsequent, oblique strike slip. We will note some slicks and discuss associated kinematics, and the nature of oblique-slip along fault segments.

At the second location we will examine strata, rock structures, and unusual mineral formations in the Flemington Fault Zone. Again, Lockatong is exposed in the foot wall and Passaic in the hanging wall. But it just happens to be the uppermost contact of the Passaic Formation with the overlying Orange Mountain basalt, where an associated hornfels zone has some copper carbonate mineralization along it. We will also see some unusual basalt breccia cemented with limestone, perhaps originating from ancient hydrothermal activity. Part of this stop is a NJGWS-GSA Geocache that can be viewed by copying and pasting the following URL into your Internet browser: [http://www.geocaching.com/seek/cache\\_details.aspx?wp=gc16br6](http://www.geocaching.com/seek/cache_details.aspx?wp=gc16br6).

#### ABOUT THE SPEAKER

Dr. Gregory C. Herman received his Bachelor's degree in Geology from Ohio University in 1982. Upon completing his Master's degree in structural geology from the University of Connecticut in 1984, he joined the NJ Department of Environmental Protection (DEP) as an assistant geologist in the Water Quality Management program, issuing Ground Water Discharge Permits to RCRA facilities. He transferred to the NJ Geological Survey (NJGS) in 1985 and began mapping bedrock geology and coauthored the revised state geological map, published by the US Geological Survey in 1997.

In 1991, he managed and helped build a computer laboratory for producing and publishing digital geological maps using Geographic Information Systems. He also helped design and organize digital libraries for cataloging the survey's geoscience data, and co-developed the survey's first web page in the DEP.

In 1996, he became the first research scientist at the NJGS, and wrote grant proposals and obtained funding to study and characterize the physical properties of fractured bedrock aquifers. This included obtaining and deploying borehole imaging systems and heat-pulse flow meters to help identify subsurface water-bearing features in sedimentary, igneous, and metamorphic bedrock. He continues to participate in fractured-bedrock aquifer framework characterization for water supply and pollution studies. During the 90's he earned his PhD degree at Rutgers University, New Brunswick (1997).

Dr. Herman has served as webmaster for the NJGS, the Appalachian Tectonics Study Group, and the Geological Association of New Jersey, where he co led field trips in 1989 and 2001. He has been on the GANJ board for over 10 years. He has published more than 50 manuscripts, maps, abstracts and digital-data products during his tenure at the survey, and recently co-produced NJGS Bulletin 77, a 500-page compendium of geologic and hydrogeologic research conducted by many researchers working in the Newark basin over the past twenty years. Greg teaches geology as an adjunct professor at Rider College and the College of New Jersey and in his spare time, maintains a website dedicated to the gathering information and exploring tectonic strain effects from large, hypervelocity bolide impacts on terrestrial planets ([www.impacttectonics.org](http://www.impacttectonics.org)).