The Geology of the Laurelwood Arboretum and Nearby Region

Dr. Marty Becker
Department of Environmental Science
William Paterson University
Wayne, NJ 07470
beckerm2@wpunj.edu

Large *Gneiss* glacial erratic between Brook and Ridge Roads, Laurelwood Arboretum
Broad Overview: New Jersey Geology

New Jersey is divided into 4 Physiographic Provinces based on:
1) Rock Type
2) Location and Geologic Age
3) Topographic Signature
4) Process of Formation

The 4 Physiographic Provinces include:
1) The Ridge and Valley
2) Highlands
3) Piedmont
4) Coastal Plain
Valley and Ridge
Highlands
Piedmont
Laurelwood Arboretum
Coastal Plain

“The Old Man of New Jersey”
Rock Basics

Exactly like the Native (indigenous or local) and Exotic (imported) trees, Laurelwood Arboretum has local bedrock and transported rocks called glacial erratics.

Local Rocks

- Shale, Sandstone and Conglomerate (sedimentary).
- Made of particles of other rocks that have been chemically and physically eroded.
- Cemented together by the mineral hematite-iron oxide. Stains everything dark, reddish-brown.
- Topographic signature—more easily eroded than other rocks, forms the valleys throughout our area and the majority of the Laurelwood Arboretum bedrock.
- Age—Jurassic approximately 130 million years old.
- Fossils—Trace fossils and dinosaur footprints.
- Origin—Rifting of Pangaea and formation of modern Atlantic Ocean.
Towaco Formation sandstone-SE-corner of LA

Towaco Formation-Sandstone with Hematite Cement

Towaco Formation-E-side of LA
Local Rocks (cont.)

- Basalt, Scoria, Gabbroid.
- Made from the cooling and crystallization of lava.
- Dark gray to black angular rocks consisting of the minerals pyroxene, plagioclase and olivine.
- Topographic signature-forms the mountains and hillsides throughout our area and the ridgelines to the east and west of the Laurelwood Arboretum. The nearby ridgelines are parts of the second and third Watchung Mountains.
- Age-also Jurassic approximately 130 million years old.
- Fossils-none
- Origin-also rifting of Pangaea and formation of modern Atlantic Ocean.
Hook Mt. Basalt-NW-corner of LA

Hook Mt. Basalt-SE-corner of LA-Rock Garden

Hook Mt. Formation-Basalt-3rd Watchung Mt.-Vizcaya Estates

Hook Mt. Formation-Basalt-3rd Watchung Mt.-Vizcaya Estates Looking west
The formation of the New Jersey Piedmont and Laurelwood Arboretum began in the Jurassic with **Rifting** and the Breakup of Pangaea.

Local sedimentary rocks were created by river erosion from topographically higher regions to the North and West. The Piedmont “Red Beds.”

Local igneous rocks were created by volcanic eruption and lava flows. The three **Watchung Mountains**.
Gneiss (Metamorphic) and others.

Glacial erratics are large boulders that have been transported into the area by the activities of our last ice age. The majority of the large boulders consist of gneiss but many other rock types can be found—usually clastic sedimentary rocks.

The gneiss comes from the Lower Hudson Valley of New York State near Harriman State Park. The clastic sedimentary rocks can come from as far away as Albany, New York and the Helderberg Mountain Region.

Age: Mostly Precambrian
Fossils: None in Igneous and Metamorphic Rocks, Rare in Sedimentary.

***Combinations of Local and Imported Rocks have been used throughout the garden to stabilize drainage cuts and creeks that flow to Laurel Pond.
Gneiss Erratic- Harriman State Park, New State-between Brook and Ridge Roads, LA

Green Pond Conglommatate Erratic- Lower Hudson Valley, NYS- near Sensory Garden, LA

Fossiliferous Sandy Limestone Erratic- Clarksville, NY- near Dorothy Way, LA

Brachiopod Fossil Clam- Marine Origin
New Jersey during last Ice Age

-The northern one third of New Jersey was covered by a large continental glacier called the *Wisconsin Glaciation*.

-The maximum advancement is indicated by the *terminal moraine*—a ridgeline of transported rock. The green line on this map.

-Large boulders from the Lower Hudson Valley and Helderberg Mountain Region of New York State are scattered throughout this area of New Jersey and the Laurelwood Arboretum.

-The surface geology and drainage patterns throughout this region have been completed sculpted and modified by this glaciation.
Bedrock Geology of Laurelwood Arboretum

Preakness Basalt - Second Watchung Mt.

Hook Mountain Basalt - Third Watchung Mt.

Boonton Formation

Towaco Formation

You are here!
Surficial Geology of Laurelwood Arboretum

Laurelwood Arboretum (Gravel/Stream Deposits)
- Qryt and Qry-Rahway Till
- r-bedrock exposure
Rahway Till - reddish yellow, sandy silt and sandy clay with weathered clasts of basalt and gneiss.

Surrounding Areas
- Qn-Netcong Till
- Qal-Alluvium
- QS-swamp deposits
- Qst-Stream terrace deposits
-The *drainage* and *surface water* flow in the Laurelwood Arboretum is controlled by topography.
-Water from the second and third Watchung Mountains flows downhill into the valley of the Laurelwood Arboretum and eventually into the main creek.
-The main creek then flows northwest into *Laurel Pond*, the *Glenn* and into the *Pompton Lake*. 
Some Geologic Recommendations for Laurelwood Arboretum: Good stuff that is happening!

1. Water is the most precious factor in the Laurelwood Arboretum. 
   -The main creek and the drainage network provides the lifeline to all the trees and plants.
   -This main creek and its tributaries need to be kept open and flowing, free from leaf and tree litter, and animal waste.
2. Soil profile needs to be protected from surface erosion by plant cover, mulch, and rocks walls along creek and drainage bends.
3. Too much impermeable surface can result in rapid run off, accelerated erosion and inability to capture water for use in arboretum.
4. Possible Future Consideration(s): Dredging Laurel Pond to capture more water to be used throughout the Arboretum. Recycling the dredged soil that will be rich in organics as a fertilizer/topsoil.
Acknowledgements
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-All the members of the Laurelwood Arboretum for all their hard work in making the Arboretum are really special place in our nearby backyards!

Some Sources for this Talk:
New Jersey Geology Survey PDF Reports:

Geology tour of some of the Laurelwood Arboretum to immediately follow.....