

Rhode Island --- The Geologic Truth Supporting Its Now Fragmented Official Name.

State of Rhode Island and Providence Plantations was the longest United States name for America's smallest state. It dates to 1633 and is listed on the colonial charter obtained by founder Roger Williams in 1644 and was changed by referendum in 2020 because of sensitivity to connotations to slavery after the George Floyd racial murder. The Rhode Island colony was active in the transatlantic slave trade sending 514 slave ships, mostly from Newport to the western coast of Africa. In the vernacular, the abbreviated Rhode Island was almost always used alone with the full name reserved for official documents and decrees. What is peculiar is that now the official name—Rhode Island--- is not accurate. Unlike a nickname like Peg for Margaret or Jack for John, the colonial epithet was descriptive of the land it was named to represent. In fact, politics must have been in play because why did the smallest part of the colony receive first billing? Not even alphabetical rules apply, for P is before R. In 1533, the Florentine explorer Giovanni da Verrazzano sailed into Narragansett Bay and wrote in his log that what we now know as Aquidneck Island looked like the Isle of Rhodes in Greece. Aquidneck Island boasts historical Newport on its southern tip. The state has many bay islands as well as the sister island to Martha Vineyard, Nantucket, Long Island, Fischer Island---Block Island---just thirteen miles off its southern coastline. But we are not just an island; most of our land is not fully surrounded by water. Shakespeare wrote that a rose by any other name would still smell as sweet, but shouldn't a proper name reflect one's identity.

It turns out that Rhode Island has an interesting geological past. And in the past, I mean going back hundreds of millions of years to over one billion years. It was never part of the precursor land mass that evolved into the North American continent. It got here by plate tectonics and was affixed like one would press on a wad of silly putty to a round, rubber ball. The Mid-Atlantic Rift today opens wider about an inch per year, but when one talks about eons of time, land masses move around, oceans are made and lost, and mountains are forged from the massive collisions of continents before they are eroded into sediments that flow into the sea. For opening a divide of an inch, a year, for one million years, it equates to 14 miles in distance!

In Celtic mythology, water and islands symbolize transformation, healing and boundaries between the ordinary and the supernatural. In Britain's legendary tales of King Arthur, Avalon is a place of magical healing and recovery as well as eternal health and youth. In geology, Avalonia is a lost continental archipelago that formed about a billion years ago only to migrate thousands of miles from its original location. Geologists call such crustal

fragments that elsewhere and move by plate tectonics, 'terrane.' Rhode Island is the only American state whose boundaries lie completely within the Avalonia lost 'microcontinent'; Avalonia is often referred to in technical jargon as a 'composite terrane' where geologists group it together with similar terranes and as such today it comprises an impressive but narrow, culturally impactful, stretch of human cultural geography. Western Avalonia was accreted [affixed] into Laurentia, the ancestor to our North American continent, and extends today from New England to Atlantic Canada. It includes the southeastern corner of Connecticut, the entirety of Rhode Island, parts of eastern Massachusetts including the Boston basin, the coastline of northeastern Maine, southern New Brunswick, Prince Edward Island, parts of Nova Scotia, and southeastern New Foundland. Western Avalonia was affixed to North America when it was still south of the Equator 400 million years ago. Across the Atlantic Ocean it continues as East Avalonia on lands including southern Ireland, southwest Great Britain including Wales, most of England including London, northern Germany, the Netherlands, most of Poland, Belgium and a sliver of the northwest of France. It was the Mid-Atlantic Rift that separated east from west as the great Atlantic Ocean Basin was created. An intact Avalonia had traveled thousands of miles to get there to be positioned well within the supercontinent Pangea, close to its center, that assembled into a conglomeration 335 million years ago. Because of the continent-to-continent collision, that occurred just when the dinosaurs gained prominence 300 million years ago, a mountain range built from the abyssal marine mud left from the disappearance of the precursor of the Atlantic Ocean traced a high seam through the heart of Pangea. The mountain range resembled the stitching on a baseball connecting where the continents came together. The Pangea continent was so large that it prevented heat from the Earth from escaping, lifting its crust a mile high so that it eventually fissured----- beginning 200 million years ago. It was composed of the precursor land configurations of Siberia, Eurasia, North America, South America, Antarctica, India, Africa and Australia. Avalonia, also split apart when Pangea broke up, its remains divided by the rift which developed into the Atlantic Ocean. Old England and New England started to separate at a rate of growth equal to a human fingernail's each year. Both now lie in the middle of their respective continental plates, and Rhode Island is at the far west while its eastern border approaches northwest Africa, off Morocco. England and its younger namesake in America still have many similarities due to its common Avalonian heritage. Both parts drifted into the mid-latitudes with abundant rainfall due to their maritime climates. Heavy rains and perennial streams eroded their rugged highlands to low plateaus that gently rolled inward from their respective coastal plains. Both experienced frigid glaciation in cycles over the past two million years that created stony landscapes. In England, the ice sheets halted near London and in New England the terminal moraines of the last glaciation that ended over 11, 000 years ago deposited the raw material for the islands ranging from Nantucket to

Long Island. When the ice sheets melted, Narragansett Bay as well as the Thames Rivers in New London, Connecticut and London, England were flooded. Deepwater estuaries and salt marshes developed in both lands, parts of which today closely resemble one another.

The origins of Avalonia go back to at least the Paleozoic Age and perhaps one billion years ago as it developed as a volcanic arc off the northern coast of Gondwana, the massive supercontinent of the epoch. The massive land mass was composed of Mexico, South America, Arabia, India, Africa, Iberia, Australia, and Antarctica that ranged from the South Pole to 30 degrees South latitude; Avalon as an arc of volcanic **islands** by 420 million years ago had by then drifted away edging closer to nearby Laurentia, the precursor of North America. It as a terrane was not alone. There were smaller terranes that preceded it, and some that subsequently followed it [i.e. Ganderia, Meguma and Carolina]. Recall that Boston in eastern Massachusetts, Rhode Island and southeast Connecticut comprised its terminal edge westward, and Avalonia as a microcontinent was the largest terrane of its time that emanated from Gondwana. As it drifted from Gondwana to the northwest, the Iapetus Ocean, the precursor to the Atlantic, shrank before it while the Rheic Ocean rifted opened behind it. It had an intense subduction zone ahead of it and an active volcanic fissure behind it that produced prolific magmatic eruptions 630 to 590 million years ago, and the volcanic island chain resembled the later formation of Japan in the Pacific Ocean. The Atlantic Ocean did not form until 150 million years ago during the Jurassic period. Before Avalonia affixed itself to Laurentia, it collided with Baltica, the ancient precursor to northwestern Europe that includes today the lands of the Baltic, Scandinavia and those west of the Ural Mountains. Today, Baltica's boundaries run north of the line connecting the North Sea and Black Sea, and it as said collided with eastern Avalonia in the late Ordovician period, 440 million years ago, at 30 degrees South Latitude. The complex of Avalonia-Baltica drifted to the northwest toward the North American land mass. The collision of Avalonia-Baltica with Laurentia closed the Iapetus Ocean, promoted vulcanism in Avalonia and mountain building in eastern Laurentia in Greenland and in Scandinavia, Scotland, and northwestern Europe. When West Avalonia abutted Laurentia but prior to its accretion to the land mass, it also caused mountain building in the Acadian Orogeny that started 375 million years ago during the Middle Devonian period lasted fifty million years and transversed in a southwest direction from the Canadian Maritimes to Alabama, building the Appalachian Mountain range. The Alleghany mountains are also part of the Appalachian mountain range, extending from northwestern Pennsylvania to southwestern Virginia. In Europe, the same collision is termed the Caledonian Orogeny. This mountain building was related to the final closing of the Iapetus Ocean and the docking of Eastern Avalon with Baltica, and the orogeny finally accelerated as the enlarged Baltica drifted

westward to collide with Laurentia. The initial docking of Eastern Avalonia with Baltica occurred in southern Denmark, the southwest corner of the Baltic Sea and Poland.

Rhode Island has undergone many geological changes, but evidence of the past Avalonia plutonic magmatism exists although mostly hidden today. Its famous Narragansett Basin was created by folding and faulting of Pennsylvanian-aged sedimentary rocks consisting of sandstones, shales and conglomerates that occurred 299 to 250 million years ago during the Allegheny mountain formation, and Rhode Island's geology is related to the greater New England geology. The Narragansett basin sits on a suture or boundary zone where the Avalonia microcontinent converged with the North American tectonic plate and accreted to it during the Permian period [290 to 250 mya]. The sediments deposited by alluvial runoff from the erosion of the mountain building orogeny starting in the Acadian orogeny filled the Narragansett basin 12,000 feet deep, serving as substantial substrate for its sedimentary rock formations. Some of those sedimentary rocks were later metamorphosized. These rocks, however, are more prone to weathering than the granite and gneiss that surround them in the highlands to the west and the east, and this adds to their lower positioning topographically than the bordering uplands. Subsequent glaciation chiseled the bedrock and deposited glacial features aplenty including the formation of the Charlestown Moraine and Block Island. Meltwater and the sea level rise after the last Ice Age drowned the Narragansett Basin and its river valleys to leave us the great bay and its over thirty islands. The Westerly granite quarries that provided superior stone are young but sit on the igneous basement rocks of ancient Avalonia, some of which are one billion years old.

Rhode Island, is the small state's proper name now, official but misleading; knowing its geological history better, at least for me, given the extent of its journey as the occidental point of the primordial island chain of Avalonia, adds authentication, gravitas and credence to its selection by the people of our State because maybe once an island, always an island at heart; no matter when and how it found its ultimate home grounded on the eastern coastline of North America anchored between the metropolises of Boston and New York City. The fragmentation of Its original and illustrative name perhaps parallels its long geological journey of an island arc that split apart long ago but still connects us to our other half now an ocean away across the Atlantic.

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