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MORNING ON CHESAPEAKE

By Jay Bell

I slide my kayak into the tranquil waters of the Chesapeake Bay as the first glow of sunrise is appearing behind me in the eastern sky. The bay is quiet today, waters smooth as glass as only happens a few times during the summer. There are many mornings when the winds and the tidal currents conspire to make it impossible for a small craft like a kayak, but this is a perfect morning to be on the bay. I paddle about a half mile offshore; near the last sandbar, I pivot and point the bow toward the east so I can watch the sunrise, and soon it slowly appears in the loblolly pines that line the coast. The effect is stunning: a bright ball of light mounting the pines as a bright sparkly reflection of sunrise streaks toward me reflected in the waters of the bay. The Chesapeake

Sunrise over the pines and the bay. Image courtesy of the author.

is quiet in the early morning hours—except for the birds. I look up and see two ospreys circling, looking for fish. A small flock of terns dart about, diving into the bay now and then for the plentiful minnows as a squadron of pelicans skims the water farther from shore. The ever-present laughing gulls glide down the coast and I spot a great blue heron stalking minnows from the beach. I marvel at the beauty and serenity of this place and how the water, land, and people came to be on this spot of the planet.

My family settled on this narrow, sandy peninsula to my east, known as Virginia's Eastern Shore, in the early 1600s, and I still own the farm we acquired in 1670 in the small town of Marionville. The geologic formation of Virginia's Eastern Shore involves tales of meteors, continental glaciations, drastic changes in sea level, ancient rivers, and a process known as longshore drift. I'm currently floating in my kayak about half way down Virginia's Eastern Shore between Nassawadox and Occohonnock creeks. To the south about 18 miles is the harbor town of Cape Charles. Sometime around 35 million years ago, a large meteor struck the earth near that location. The impact crater was over 50 miles across; I would have been sitting near the rim in my current location and I ponder that I would have been vaporized upon the impact. The impact crater created a dent, a low spot, in the earth's crust, and as the continent assumed something close to its current location, the great rivers of Pennsylvania, Maryland, and Virginia

The author and his grandfather in the early 1960's on the family property. Image courtesy of the author.

(Susquehanna, Potomac, York, Rappahannock, and James, along with many smaller tributaries) would have flowed toward this depression that eventually became the Chesapeake Bay we see today.

Even though the Chesapeake Bay was never covered with continental ice, the episodic glaciations of the last million years or so had a profound effect on the formation of the Chesapeake Bay and the Eastern Shore of Virginia. Glacial stages resulted in vast quantities of water being tied up in ice to the point that the world's seas dropped in the vicinity of 300–400 feet and would have returned to approximately the current sea level (sometimes higher) during the warm period between glaciations (interglacials). There have been multiple episodes of glacial and interglacial stages, each lasting approximately 50–100 thousand years. I'm skimming over a lot of detail here, but for our purposes, that's OK.

As a soil scientist, I've always longed for a time machine to take me back to see how our soils and landscapes formed. Lacking the invention of H.G. Well's imagination, I turn on the time machine in my mind to hundreds of thousands of years ago and reconstruct the formation of Virginia's Eastern Shore and the Chesapeake Bay. If we go back in time 400,000 years, we would find ourselves in an interglacial (warm) stage. Sea levels would be about where they are today; however, there is no Eastern Shore to my east. It's likely that from my kayak I would not be able to see land anywhere and would be in the Atlantic Ocean—not a great spot to be in a small kayak. The Chesapeake Bay would extend down to about the Virginia-Maryland state line and from there south, Virginia's mainland would be oceanfront (like Virginia Beach today). It would be a very long day's paddle across the ocean for me to get to land. The ocean swells are several feet high and capsizing would be a definite possibility, so I engage my mental time machine and fast forward 50,000 years to about 350,000 years ago.

Things have changed dramatically. My kayak is sitting on dry ground and there is no water to be seen. We are in the Kansanian glacial stage, so much of the global ice is locked up in glaciers and sea levels are approximately 300–400 feet lower than today. My kayak is stranded about 50 miles from the coast to the east—approximately where the continental shelf is located. The landscape is relatively flat and it's cooler than before. The loblolly pines have been replaced by spruce and fir trees in this cooler climate. I get out of my kayak and look around, nothing but land as far as I can see. The Susquehanna River is about 40 miles to the north near today's Virginia-Maryland state line. From there the Susquehanna River heads east 50 miles across the coastal plain to the Atlantic Ocean.

I get back in my kayak and fast forward to about 210,000 years ago during another interglacial period. I'm back floating in my kayak again. I'm facing east and I see the tip of the Eastern Shore, maybe a few miles to my northeast. So how did it get there? Remember we are near the end of an interglacial period, so the sea level is similar to today's. Because ocean waves predominantly come from the northeast, they will tend to move sand to the south via longshore drift. The waves strike the beaches at a slight angle, causing a migration of sand to the south and creating new sand bars and land. During this interglacial period, essentially a large sand bar was created and extended the land southward about 20 miles. This new land, known as the Accomac spit, extended the Chesapeake Bay about 20 miles south as well. So the Eastern Shore peninsula extends south during interglacial stages via longshore drift and is a high point in the landscape and is stable during glacial stages. I'm where the bay meets the ocean and the waves are still a bit rough for my liking, but it's only a couple hour's paddle back to land—assuming the wind isn't blowing.

The author heading out into Chesapeake Bay on his kayak. Image courtesy of the author.

So back to my time machine and let's fast forward to 160,000 years ago during the Illinoian glacial stage. The sea levels dropped again and I'm back on dry land. It looks sort of like the last glacial period, except I can now see the Susquehanna River valley and the big bend as it turns east around the southern tip of the peninsula (Eastern Shore) and across 50 miles of coastal plain flowing to the Atlantic. As the peninsula has grown southward, the river has extended from Maryland to my current location before making its eastward turn toward the ocean. As I step out of my kayak and look around, I see no bay or ocean—to the north I see the Susquehanna River flowing south toward me, to the west I see the Susquehanna River a few miles away, to the south I see the river bending eastward below me, and to the east I'm looking across a 50-mile wide coastal plain extending to the Atlantic Ocean. So I'm on a high point (relatively speaking) between the Susquehanna River and the Atlantic and a good week's hike to reach the ocean.

I climb back in my kayak and my time machine takes me to 125,000 years ago during the Sangamon interglacial stage. Things look quite familiar now, not much different from when I paddled out into the Chesapeake this morning. The bay is about 20 miles wide to the west at this point and the Eastern Shore peninsula extends to the south about as far as I can see. During this interglacial stage the peninsula has continued to extend to the south, lengthening the Eastern Shore by approximately 18 miles to near present-day Cape Charles. This new land is known as the Nassawadox Spit Extension and the land where my family farm is located has been created. I'm well within the Chesapeake Bay and the waters are much calmer. I could paddle to the tip of the peninsula in one long day—if I was 40 years younger and the tidal currents were running south.

I quickly fast forward through the last glacial stage (Wisconsinian) and the sea levels have dropped again and I'm on dry land. I look to the west and see the Susquehanna River valley extending southward. I'm 50 miles inland once more and the Chesapeake Bay has been replaced once again by the Susquehanna River. As we continue to travel forward in time, the many tributaries flowing into the Susquannah will become flooded when the ice melts and sea levels rise toward the end of the Wisconsinian glacial stage. They will become the tidal estuaries where I love to fish for Rockfish, Speckled Trout, and Flounder. These estuaries provide the essential shallow water environments that are required for fish spawning, clams, oysters, and blue crabs. As the time travel in my mind comes to an end, I'm returned to the quiet morning waters of the Chesapeake and I watch the sun as a new day dawns. All the familiar landmarks have returned. Since the retreat of the Wisconsinian glacial ice around 12,000 years ago, the interglacial stage we are currently in (the Holocene) has seen further southward extension of the Eastern Shore Peninsula. During the Holocene, the peninsula extended another 14 miles to Fisherman's Island where the Chesapeake Bay Bridge Tunnel connects the Virginia Mainland to the Eastern Shore. Fisherman's Island at the southern end of the Eastern Shore peninsula did not even exist in the early 1800s, yet continues to extend southward with every grain of sand transported down the barrier islands. The details of this geologic process are indeed complex and complicated and sea-level rise and land subsidence will affect it in ways we do not fully understand. I consider our own family farm that is adjacent to the saltwater marsh and how a few feet of sea level rise could turn it from farmland into marsh in the not so distant future—a disappearing legacy of nearly 400 years of farming by my family. I also consider that my family's time on the land is but a brief moment in the geologic history of the peninsula. The advance and retreat of glaciers and the southern movement of sands formed this land, and the crabs, oysters, fish, birds, and other wildlife are the true long-term residents.

I head back to land in my kayak, straight into the dazzling sparkle of the sunrise on the water. Beneath my kayak, I consider the importance of this water body to biological systems. It consists of 11,684 miles of shoreline and the shallow salt water marshes that are home for thousands of plants and animals, some permanent residents and many migratory. The shallows of the bay are critical spawning grounds for hundreds of marine species and waterfowl that will spend most of their lives beyond the bay, but their lives begin and are nourished in the Chesapeake Bay. The 18 million humans that inhabit the Chesapeake Bay watershed have significantly impacted the water quality of the bay, and overharvesting of marine life has significantly altered its ecology. As I approach the beach, I'm reminded again of the insightful words of Robin Wall Kimmerer: "To love a place is not enough. We must find ways to heal it."

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About the Author

Jay Bell was raised in the Appalachian Mountain region and the Eastern Shore of Virginia and attended Virginia Tech for his B.S. and M.S. degrees and Penn State for his Ph.D. Bell and his family moved to Minnesota in 1991 for his faculty position in the Department of Soil, Water and Climate at the University of Minnesota. His research has focused on soils of wetland environments, digital soil mapping and terrain analysis, soil geomorphology and carbon dynamics in wetland soils. He spent two academic leaves in Australia and worked in Morocco, Tanzania, Uganda, and Costa Rica. He has received numerous teaching awards and served as the Associate Dean of Academic Programs and Faculty Affairs for his college from 2008 to 2015. He teaches Basic Soil Science, Wetland Soils, Wetlands, Field Studies of Soils and a course on the Mississippi River corridor with an environmental historian. Bell and his wife spend summers on the Chesapeake Bay in Virginia where his family roots are. He enjoys traveling, hiking, biking, kayaking, cooking and he tries to still play the guitar when he can. He and his wife enjoy spending time with their two sons and their wives, who live in the Twin Cities, and especially their granddaughter. He is looking forward to retirement in the coming year and spending more time in Virginia, but Minnesota will always be home for a part of the year.