Species Description (•*indigenous to Virginia Marine Waters)*

SHIELDS
Wall Case Right:

Broad Club Cuttlefish, Sepia Latimanus: ceramic, 22" h x 15"w x 8"d
This cephalopod is the ultimate shape shifter, color changing technician and yes, cross-dresser. Found around the world but absent in the Americas it has 3 hearts, 8 legs, "W" shaped eyes and the largest brain of any invertebrate. A master of light shows it has a dual layer lighting system. With 20 million pigment cells in its skins called chromataphores connected in a muscular web that contract and expand to produce moving patterns in color. Beneath the skin are iridescent reflecting cells joining the display in waves throughout out its body that stun its prey. Its sensitive eyes detect light, color and texture in its surroundings. In a flash it shifts from an attention getting smooth performer to vanish camouflaged in raised textured skin responding to its environment. Its tentacles help deflect its presence becoming coral or algae-like appendages. Some males present as females while larger males battle it out and sneak off with the female to mate.

•*Vampire Squid from Hell*, *Vampyroteuthis Infernalis*: ceramic, 20"h x 22"w x 9"d
This ancient gentle creature is the ancestor to the squid and octopus. After millions of years, it continues to inhabit the oxygen deprived ocean depths of the Atlantic, Pacific and Indian oceans. Just over 5" long this small cephalopod sports a red hooded cape with large blue eyes and tentacles lined in protective "fangs" along their interior. It has 2 long flagella that reach out to collect its diet of "marine snow", detritus and decay on a film of mucous which it balls up and eats. In moments of protection the vampire squid turns itself inside out exposing the threatening "fangs" in a strategy called the "pineapple move".

•*Radiolaria Cyrtoidea 2:* ceramic, 9.25"h x 5.5"w x 1.5"d
Ceramic shield gives a microscopic glimpse to this single-cell marine organism. Radiolaria are silica structures housing plankton in their intricate glass architecture. First named and described by E. Haeckel in 1862, Cyrtoidea- is by far largest of all orders of Radiolaria. Remarkable with extraordinary diversity of forms and number of species. Cyrtoidea comprise about one-fourth of the number of species in the Radiolaria subclass. See description for more details on Radiolaria in the Single Cell Mingle.

•*Blue Crab, Callinectes Sapidus:* ceramic, 4.25"h x 8"w x 9"d
Beautiful Swimmer from the Latin is indigenous to the Virginia coast and tidal rivers and also known as the Chesapeake Blue Crab or Atlantic Blue Crab. The Blue crab's carapace (shell) varies in color from bluish to olive green, and can reach up to 9 inches across measured point to point. The carapace has nine marginal teeth on each side; the ninth teeth are actually strong spines. Its claws are bright blue, and those on mature females feature red tips. Blue crabs have three pairs of walking legs and paddle-shaped rear swimming legs. Male blue crabs are known as "jimmies," while mature females are called "sooks." Males have a tapered abdomen, or "apron," that has an inverted "T" resembling the Washington Monument. Immature females have a triangular abdomen and mature females have a broad, rounded apron some say likens the National Capitol dome.

Range spreads from Nova Scotia to Argentina in the western Atlantic Ocean. This bottom-dwelling crustacean uses all of the Chesapeake Bay's habitats during the course of its life and can be found in the Chesapeake Bay and its tidal rivers year-round. The Chesapeake Bay, the largest estuary in the United States, is an extremely productive and complex ecosystem. The Bay ecosystem consists of the Bay itself, its local rivers and streams, and all the plants and animals it supports. Like any other system, an ecosystem is composed of interrelated parts that interact

with each other to form a whole. Every living thing needs a healthy ecosystem to survive. Human activities affect the Chesapeake Bay ecosystem by adding pollution, using resources and changing the character of the land. However, we can make better choices in our everyday lives to lessen our footprint on the Bay ecosystem's health. Blue crabs were over fished and dropped to critical levels in the 90's and have been struggling but making a comeback in recent years.

The Blue crab feed on clams, oysters, mussels, smaller crustaceans, freshly dead fish, and plant and animal detritus. They will even eat smaller and soft-shelled blue crabs. Predators include large fish like croakers and red drum; fish-eating birds like great blue herons; and sea turtles. The blue crab is one of the most important commercial and recreational catches in the Chesapeake Bay, in 2014 the Blue crab catch was worth over $80 million.

•*Odontella, Diatom*: ceramic, 2.5"h x 4.25"w x 4"d
A cosmopolitan marine organism, *Odontella* includes Virginia in its residence. See description for more details on Diatoms in the Single Cell Mingle.

Wall Case Left:

•*Eastern Emerald Elysia*, *Elysia Chlorotica:* ceramic,14"h x 12"w x 3"d
Unique symbiosis between plant & animal: It resembles *Vaucheria litorea* and *Acetabularia acetabulum, the* algae which are its source of food and habitat. The amazing catch is it does *not* digest the plant but cuts open the algal filaments to suck out the living choroplast transferring it to its own tissue. Allowing the photosynthesis to continue inside its own cells, the Elysia Chlorotica can cruise on the solar power pack life support for months without eating as long as sunlight is available.

•Humpback Whale, *Megaptera Novaeangliae:* ceramic, 12.25" x 12.5" x 4.5"
Weighing in at about 25-40 tons and 50' - 80' long with natural life spans about 50 years- these intelligent giants are cosmopolitan residents of our planet migrating throughout all oceans. They filter about 3,000 pounds of plankton, krill and small fish a day through their baleen to fuel their powerful bodies. The characteristic humpback bumps actually house a single hair that acts as a sensor.

As the singers of the seas, the humpback males are known for their mythic songs which can be heard for hundreds of miles. Since they do not have vocal chords or the ability to breath through their mouths, their music is created through their blowhole. Each whale has a unique song and repeats it again and again, developing different arrangements over time. They sing to each other and collaborate creating impromptu scores.

When a fellow whale is injured or dies, they wail in mourning. The part of their brain governing this self-awareness, intuition and emotion is three times larger proportionately than ours. This highly sensitive being not only has profound depth of awareness, it has a high-speed network relaying this information via spindle cells forming a rapid transit throughout its brain. Although humans only discovered this in 2006, whales have been successful without our interference for 65 million years as a species. They teach their young by example in highly developed matriarchal and interdependent communities.

A brilliant collaborative fishing strategy unique to humpbacks is *bubble netting*. One male circles the school of fish enclosing them in a wall of air while others sound off scaring the spiral of fish towards the surface. Corralled in a package, the humpbacks open their mouths and inhale the confused prey.

We came close to erasing this intelligent, sensitive and still endangered species in less than 100 years of whaling, sound, toxic waste and plastic pollution. By the mid sixties nearing extinction they became and still are protected against commercial whaling. It was the recording of their songs in the seventies that helped raise awareness and initiated their slow recovery, one calf at

a time. Humpback mothers carry their baby for a year before birthing, then nurture and teach them for their first year of life.

These performance artists of the whale family display dramatic aerial moves, such as breaching or slapping the surface with their fins, torso and tails. Their flukes or tails are unique like their songs and identify individuals. Their characteristically long pectoral fins are a third of their length and navigate their acrobatic choreography.

•*Stellate Diatom Colony of Thalassionema*: ceramic, 8"h x 8"w x 4"
Marine single-cell silica structure housing plankton forms star-shaped colonies. This pennate type of diatom connects by producing cushions at points of contact that fuse the individuals into strands or complex star formations like this sculpture. The separate uni-cell diatoms come together for mutual benefit and empower their nutrient and oxygen production.
See description for more details on Diatoms in the Single Cell Mingle

•*Radiolaria Cyrtoidea 1:* ceramic, 22" x 24" x 12"
The ceramic shield gives a microscopic glimpse to this single-cell marine organism. Radiolaria produce silica structures to live in intricate glass architecture.
First named and described by E. Haeckel in 1862, Cyrtoidea- is by far largest of all orders of Radiolaria. Remarkable with extraordinary diversity of forms and number of species. Cyrtoidea comprise about one-fourth of number of species in whole subclass of Radiolaria. See description for more details on Radiolaria in the Single Cell Mingle.

Floor Vitrine Cases:

Single Cell Mingle: Marine Milky Way for David:
A tribute to my brother David Hagan, physicist, poet, humanitarian, educator, mentor and visionary for his 30 years of brilliant, devoted and dedicated service to the Commonwealth of Virginia as Staff Scientist for the Science Museum of Virginia.

Single Cells and the Sunlight Zone:
The ceramic reveals these exquisite and mighty microscopic marine gems that form the basis of earth's marine ecosystem. Marine primary producers utilize solar energy to photosynthesize over half of earth's oxygen sustaining all life and every other breath taken from anywhere around the globe. The micro goes macro as their blooms can be seen from space on satellite video.

Interdependent Network:
Single-celled species form extraordinary star or stellate colonies, strands, spirals and chains to pool their energy, helping each other and producing more oxygen and benefiting from nutrients as a result. This universal interdependence has enable life to thrive for eons. The *Thalassionema Stellate Colony, Strands*, *Dinoflagellate Fusus Partners* and *Dinoflagellate Cochlodinium Polykrikoides Chain* play on the actual architecture of individual cells connecting as one network.

Single Cell Mingle features these categories of organisms:

1.•*Radiolaria*- noun Zoology.
Origin from Latin, radius - spoke of a wheel; radiolus, diminutive - little spokes.

Radiolaria are Protista- single-cell marine organisms specifically protozoa (proto: first; zoo: animal), which produce silica skeletons with extraordinary, intricate glass architecture in which to live. Radiolaria are characterized by diverse richness of forms not only in present seas but also for millions of years in former ages of our planet. The skeletons of ancient radiolarians are used in geological dating, in oil exploration and reconstructing ancient climates. Their remains cover

much of the ocean floor in siliceous ooze. When the ocean bottom is lifted and transformed into land, the ooze becomes sedimentary rocks. Silica deposits, such as flint, chert and the abrasive tripoli originate from radiolarian skeletons. Fossil radiolarians have been found that date to Precambrian Time (3.96 billion to 540 million years ago) yet 90% of radiolaria are extinct. These delicate structures integral to our ecosystem.

2. •*Diatom* - noun Biology
Origin from Greek, *diatomos* - cut in two

Diatoms are single-celled algae whose cell well is composed of silica. Champions of photosynthesis, they earn the title: *Lungs of the Earth* providing one-fourth of oxygen for the planet. Found in fresh, marine and moisture in the soil, diatoms are working for us everywhere there is water. Diatom communities are a tool for monitoring environmental conditions past and present and commonly used in studies of water quality. There are approximately 100,00 named and described diatom species but estimates indicate there may be twice this amount. Astoundingly, diatoms are a main part of the diet for earth's gentle giant, the blue whale. Truly cosmopolitan residents, diatoms are found in marine and fresh water as well as in the moisture in the soil.

Interdependence: Ceramics & Diatoms:
None of us can live without diatoms but for most of us ceramicists we have an intimate connection. Our kiln brick is made from the remains of million year old diatoms in the form of diatomaceous earth from the ocean floor enabling us to fire our kilns. Their intricate silica structure has the same composition of our glazes and particulates of our clay body. This single cell marine organism sustains our every fourth breath and the ceramic process making this work possible.

3. •*Dinoflagellate* - noun Biology
Origin from Greek, *dino* - whirling; *flagellum* - small whip

Single cell organisms with 2 flagella are found in large numbers in marine and estuarine environs and to a less extent in fresh water. Dinoflagellates are covered in cellulose comprised of armor-like sections.

Many are photosynthetic and are second only to diatoms as marine primary producers,serving as a vital source of oxygen. Dinoflagellates are also the zooxanthellae that live symbiotically within corals, and thus have a pivotal role in the biology of reef-building corals.

4. *Foraminifera Baculogypsina Sphaerulata:*
Origin from Latin, *hole bearer*

The petit stars the size of a grain of sand that form the beaches on the shores of Okinawa: Hoshizuna No Hama/Star Shaped Sand Beach are the ancient remains of foraminiferan protozoa. This extant foraminifera inhabits the subtropical and tropical zones of the Pacific Ocean and some are known to lodge a few diatoms. Protists are somewhat of a misfit category, not quite animal, plant or fungi. This diverse group is a significant interdependent contributor to life on our planet. This little starlet are one of the 10,000+ species of foraminiferans.

Single Cell Mingle - Marine Milky Way for David, Starring Cast:

Ceratium 1, Dinoflagellate: 15"h x 16"w x 4"d

Marguerita C. Hagan

Kittonia Elaborata, Diatom: ceramic, 5.25"h x 5.5"w x 2.5"d

Fragilariopsis, Diatom: ceramic, 4.5"h x 2.5"w x 2.5"d

Odontella, Diatom: ceramic, 7.25"h x 4.25"w x 3"d

Androcyclas Gamphonycha, Radiolaria: ceramic, 6.5"h x 2.75"w x 2.75"d

Radiolaria (from Triassic period, *Longobardian* stage, 231.4-228 million years ago) ceramic, 6"h x 3.25"w x 3.5"d

Foraminifera, Protists: ceramic, 2"h x 2"w x 2"d

Colony of Thalassionema Stellate, Diatom: ceramic, 4.5"h x 5"w x .5"d

Colony of Thalassionema Strands, Diatom: ceramic, 7"h x 12" x 5"

Thalassionema Pair, Diatom: ceramic, 2.75"h x 3"w x .5"d

Thalassionema, Diatoms (2 Small Individuals): ceramic, 2.75" x .5" x .5"

Thalassionema, Diatoms (2 Petit Individuals): ceramic, 1.5" x .5" x .5"

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Fusus Partners, Dinoflagellata: ceramic, 9"h x 1.5"w x .75"d

Longirostrum, Dinoflagellate: ceramic, 11.25"h x 1"w x .75"d

Gravidum 1, Dinoflagellate: ceramic, 4"h x 2"w x 1.5"d

Gravidum 2, Dinoflagellate: ceramic, 4" x 1.75" x 1.5"

Gravidum 3, Dinoflagellate: ceramic, 2.75" x 1.25" x 1.25"

Chain Cochlodinium Polykrikoides, Dinoflagellata: ceramic, 8"h x 1.5"w x 1.5"d

• *Ceratium Ranipes Cycle Dinoflagellate:*
The growth cycle of the rapines is a 24 hour dramatic performance. During the sunlight hours the chloroplast filled digits bud and grow into spectacular examples. The photosynthesizing fingers use the sun's energy to create oxygen for the planet. When the evening comes and the sun sets, the fingers recede and disappear. This cycle repeats each day and night. Marine single-celled organisms in the sunlight zone of the ocean create more than half of the oxygen on earth. See description for more details on Dinoflagellates in the Single Cell Mingle.

Ceratium Ranipes Spectaculare Dinoflagellate 1: ceramic, 10"h x 10.5"w x 8"d

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Ceratium Ranipes 2 Dinoflagellate: ceramic, 6"h x 9.25"w x 4"d

Ceratium Ranipes 3 Dinoflagellate: ceramic, 4.75" x 6.25" x 2.5"

Ceratium Ranipes 4 Dinoflagellate, ceramic, 4.25"h x 5.5"w x 1.5"d

Ceratium Ranipes 5 Dinoflagellate, ceramic, 5.25"h x 6"w x 1.5"d

•*Kemp's Ridley Sea Turtle Hatchling, Lepidochelys Kempii* - Tribute to Ridley: ceramic, 24K gold leaf, Iceland spar calcite crystal, 4.75"h x 5.5"w x 1.5"d
This marine turtle native to the North Atlantic Ocean and the Gulf of Mexico shares its name with my sister Ridley. My Wildlife series seed was planted thanks to Ridley and her husband David Boocock who lobstered with my brother Michael. They were responsible for my first tropical experience in Hawaii when I was 25. Snorkeling in the reef launched my Wildlife series. The work has evolved over my career yet my first view of this extraordinary life is indelible. Thank you Ridley and David Boocock for the gift that continues to move me to no end.

It is the smallest, rarest and most endangered of all sea turtles and critically endangered since 1970. The nest processions called *arribidas* make for high nocturnal drama. The hatchlings have one tooth, *caruncle,* designed for the sole purpose of breaking through their shell. Once hatched on the same beach its mother and previous generations were born, the hatchling must make its way into the ocean. Those that survive this perilous first trek to the surf must next overcome the journey seaward to live in the pelagic zone or open ocean for 7-12 years until sexually mature. With a stellar internal "GPS" using Earth's magnetic field, the females swim hundreds of miles back to their birth beach to nest their clutches of eggs.

Documentation in 1947 recorded approximately 42,000 females nesting on one beach off the Gulf of Mexico. Today the National Wildlife Federation estimates of 1,000 total breeding females exist worldwide. The threats are the usual suspects at the hand of humans: fishing gear, pollution, over harvesting eggs and meat, oil spills and climate change. A particularly lethal weapon to the welfare of sea life is the overwhelming amount of plastic now residing in the ocean. Sea turtles mistakingly fill up on plastic debris, which look like jelly fish floating in the ocean. mistakingly fill up on plastic debris. Feeling full with plastic, the turtles actually die of starvation or choke. The volumes of plastic are so immense they have their own migratory patterns now tracked on satellite.

The greenish-gray back and white belly shell or carapace of the adult Ridley is the roundest of the sea turtles, 2' long and weighing about100 pounds. Its favorite meal is the blue crab along with other shellfish, jellyfish and plankton. It can live 30-50 years if given the chance.

Argonaut Argo, Argonautidae: ceramic, sterling silver, 5.75"h x 5.25"w x 2.5"d
Records of Argonauta are date as early as 300 BC. Aristotle described the the webbed first arms as sails catching the wind and the female's shell as its boat. This rarely seen octopus is named after the Greek sailors who went on a quest in search of the Golden Fleece protected by the Goddess Hera. These technically savvy arms actually secrete calcium carbonate engineering her exquisite one chambered shell and like the rest of the body, contain chromatophores enabling it to change color from reflective silver to dark maroon. The Argonaut larvae are equipped with chromatophores and change color at birth.

The female is detached from her shell unlike the nautilus. The shell protects her and her eggs and acts as a buoyancy device. She can regulate the air to float at the surface or sink below in the pelagic zone/open ocean habitat. However, the rise in human induced CO2 dissolves the security of her shell. The *Argonaut argo* is the largest of the Argonaut but exclusively female argonauts have a shell. The shell-less dwarf male is 10% of the female measuring just a few centimeters (.75") and the females about 10 centimeters (almost 4"). The male's third arm locks inside the female during fertilization and then it breaks off and he dies. The female Argonaut goes on to mate numerous times hatching about 6,500 babies unlike other female octopus that die after giving birth.

Like members of their octopus family, Argonauta have 8 arms and squirt water through their funnel to motor. They feed on sea butterflies (pteropods) and small fish and its predators are yellow fin and big-eye tuna and seabirds, which they ink in a getaway defense. Argonaut can connect to form chains of 20-30 floating on their sides in the open ocean.

•*True Lobster, Homarus Americanus* - Homage to Michael:
ceramic, 24K gold leaf, velvet, sand, 5.5"h x 13"w x 2.5"d
Few realize that this large marine crustacean widely known as a *Maine l*obster also lives 100 miles off the Virginia coast at the Atlantic shelf. My brother Michael Hagan (1949-1987) - known as a trail blazer, fisherman and nature lover - set his pots in these colder, deeper Virginia waters and successfully became one of the first commercial lobsterman in the state. A tribute to his vision, passion, love of life, nature and unsinkable wit.

This lobster inhabits the eastern coast of North America between Nova Scotia and North Carolina living in crevices and burrows on the sea floor. When feeding, the crusher claw catches its prey and its sharper claw dissects it. Averaging 10"- 20" in length, lobsters live 45 - 50 years in the wild.

•*Odontella Trio Colony, Diatom - Interdependence:*
ceramic, velvet, sand, 6.75"h x 11.25"w x 5.25"d
Diatoms form mutually supportive networks by fusing together. Producing a gelatinous substance these Odontellas attach in chains and spirals at their "horns". Forming colonies allow the pilot-less individual diatoms living at the mercy of the currents to navigate and enabling them to take advantage of nutrient rich waters fro example. When the microscopic diatoms bloom (i.e. undergo rapid population growth), they can be seen from space giving a macro perspective. This sculpture magnifies the imagine microscopic detail of an Odontella colony. See description for more details on Diatoms in the Single Cell Mingle.

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