Coastal Heritage

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Exploring early Carolina's natural riches

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ON THE COVER: *Between 1732 and 1743, the English explorer, artist, and writer Mark Catesby published a two-volume book in which he described and illustrated North American flora and fauna, including the Ivory-billed Woodpecker* (Campephilus principalis)*, widely thought to be extinct in the late twentieth century. Only 50 originals of Catesby's book still exist, including this one at historic Middleton Place.* **PHOTO/WADE SPEES**

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TREASURE TROVE. *Rudy Mancke, the naturalist and lecturer, in his office at the University of South Carolina, says, "It was the South that really got early attention from European naturalists" because of its extraordinary biological wealth.* **PHOTO/WADE SPEES**

Exploring early Carolina's natural riches

by John H. Tibbetts

They were explorers who arrived in Charleston to study and collect natural riches of the southern colonies. From the beginning of the eighteenth century to the American Revolution, Charleston was a launching site for naturalists who would gain renown for investigating America's wild places and advancing scientific knowledge of the New World.

Charleston by far was the largest port in the southern British colonies. A series of adventuresome scientists made the city a base where they purchased supplies, consulted local residents who were knowledgeable naturalists themselves, and prepared to travel through the South.

Eighteenth-century explorers were intrigued by South Carolina's habitat diversity in a relatively small geographic area: sandy beaches, salt marshes, cypress swamps, blackwater rivers, the coastal plain, sandhills, piedmont, foothills, and mountains.

Rudy Mancke, the state's best-known contemporary naturalist, says that South Carolina offered "the same kind of feeling we have today when we go to Costa Rica or some other place with tropical rainforests. Early naturalists were just amazed at the biological diversity here."

In 1748, a group of young men created the Charleston Library Society, which was the first scientific society in the southern colonies. By then, lowcountry rice planters had accumulated enormous wealth that allowed them time and leisure to pursue natural history. When the society proposed creating what later became the Charleston Museum, local gentry were called on to help gather plants and animals for scientific study.

On foot, by horse, or by boat, exploring naturalists set out from Charleston through the southern colonies, gathering plants, seeds, animals (dead and alive), insects, minerals, and fossils. It was a dangerous business—they confronted predators, storms, and disease. Some drew pictures of wildlife, especially plants, fish, and birds. And they sent a stream of specimens to Europe or to naturalists in the northern colonies.

John Ray
1627-1705
This English naturalist was the first to define species as a group of individuals sharing a number of characteristics that would be perpetuated in their offspring.

Mark Catesby
1683-1749
He published the most authoritative book on American natural history for the next century after its publication.

John Bartram
1699-1777
A Quaker farmer and naturalist, he discovered and introduced many rare and previously unknown plants to the scientific community.

Carolus Linnaeus
1707-1778
This Swedish doctor developed an immensely influential system of classification that could be applied to all living things.

William Bartram
1739-1823
Explorer, writer, artist, he was one of the most important figures in the development of American natural history.

In the 1760s, American naturalist William Bartram wrote of a Venus flytrap plant: "There, behold, one of the leaves just closed upon a struggling fly; another has gotten a worm; its hold is sure, its prey can never escape—carnivorous vegetable!"

Many specimens from American colonies were received with excitement in Europe, where they were held in private collections, planted in gardens, or studied for potential medicinal properties.

Europeans returned the favor by shipping scientific journals, pamphlets, and books across the Atlantic to the colonies. Until the early nineteenth century, Americans relied almost exclusively on Europe for many basic supplies of science: pens, ink, high-quality paper, and instruments such as microscopes and telescopes.

Influential colonial naturalists were seen as capable and thoughtful observers but rarely as scientists of real distinction. Americans lived, after all, in a backwater. Many European scientists considered the Old World as the only place where high-level thinking could occur. So when colonials discovered a New World species, it was usually shipped to Europe to be identified, named, and classified, even though many European naturalists had never even visited the Americas.

European condescension, particularly from the British, became a source of lingering resentment.

In 1764, Alexander Garden, a Charleston physician and naturalist, complained in a letter about European botanists who "use a dictatorial power over us and our performances." Garden was keenly resentful of Europeans who believed they had greater knowledge of American species.

Who were the naturalists of the Age of Enlightenment in Europe and America?

Some were hard-working physicians who explored natural history in spare moments. Others were wealthy

BOTANICAL WONDER. ***The Yellow Trumpet Pitcher Plant (*Sarracenia flava*), like this one, can be found in numerous locations in the Francis Marion National Forest. Early naturalists were fascinated by this carnivorous plant, which grows in boggy, open, fire-dominant ecosystems, says Richard Porcher (background), a retired professor of botany at The Citadel, shown consulting his book* A Guide to Wildflowers in South Carolina. **PHOTO/WADE SPEES**

Thomas Walter
1740?-1789
A British-American planter on the Santee River, he collected and described hundreds of species in coastal South Carolina, many new to science.

André Michaux
1746-1802
A French naturalist, he purchased a plantation near Charleston in 1787 and introduced plants such as crepe myrtle, mimosa, and camellia to the lowcountry.

Georges Cuvier
1769-1832
This French naturalist revealed the nature and diversity of fossil bones and explained how these remains belonged to extinct animals.

Charles Darwin
1809-1882
Author of *On the Origin of Species*, he revolutionized biological science.

Alfred Russel Wallace
1823-1913
In his fieldwork, observations, and collaborations with Charles Darwin, Wallace helped lay the foundations for the theory of evolution by natural selection.

amateur generalists, studying sciences from biology to botany to geology. By collecting and cataloging specimens, they hoped to grasp the underlying principles of order in nature. "Nothing is sweeter than to know all things," wrote an Italian naturalist, Ulisse Aldrovandi, who gathered 18,000 specimens in his private "cabinet of curiosities."

Within aristocratic circles, knowledge of natural philosophy—the eighteenth-century name for natural science—was an indicator of a gentleman's sophistication and refinement. (What we now call philosophy was called metaphysics.) Intellectually minded gentry saw themselves as detached observers of nature, untouched by matters of money in their practice of science. A gentleman considered it vulgar to acknowledge financial motives for an interest in natural history.

Still, mercantile interests drove much of the effort to understand biological resources in the New World. The early Spanish conquistadors searched the Americas for gold and silver. But, later, European botanists began searching for "green gold"—valuable plants that could be cultivated in tropical regions to create imperial wealth.

In the 1640s, Britain established its first Caribbean sugar plantations and soon became the dominant force in Atlantic slaving and maritime trade. The British realized that unprecedented profits could be produced from raising tobacco and sugarcane for European consumption.

They also understood that scientific and technical knowledge—combined with maritime trade, naval strength, and colonial expansion—would increase the nation's wealth and power. In 1660, the Royal Society of London, the first important scientific organization in Europe, was founded.

The Royal Society included many important British natural historians as members or officers. Scientists gathered to talk about new findings and organize fundraising for research and fieldwork in distant lands. Colonials, however, were not permitted to join, even if they were British citizens.

RUDY MANCKE

"The early naturalists who were artists were making a major difference, capturing things in a way that gave a visual sense of what they were observing."

Only a decade after the Royal Society was created, Charles Town was founded, and British influence spread to the southeastern coast of North America. Carolina colonists experimented with cultivating many different crops, eventually settling on rice, indigo, and sea-island cotton for export to Europe.

European nations that lacked colonies in hot climates also sought a piece of the botanical action. Carolus Linnaeus, a Swedish practicing physician and botanist, set out to learn whether tropical plants could be cultivated successfully in cold northern Europe.

In the 1750s, Linnaeus gained distinction for creating a system of naming plants—a reproductive classification based on the number of stamens and pistils in the flowers. This was a time when scientists were deeply absorbed in categorizing and labeling nature. Naturalists took advantage of Linnaeus' easy-to-learn system (improved by later generations of scientists), which gave official Latin names to species.

His system allowed both novices and professionals to identify species. Anyone could look at a drawing or painting of a species in a book and one in the wild to see if there was a match. This process greatly increased the popularity of natural-history study, initially in Europe and later in the colonies.

The artistic skills of early naturalists were particularly valuable to the far-flung community of scientists. "They couldn't take photographs of course," says Mancke, "so the early naturalists who were artists were making a major difference, capturing things in a way that gave a visual sense of what they were observing."

Like most scientists of his day, Linnaeus believed in nature's perfection and completeness—that is, each species was brought into the world unchanged and fundamentally unchangeable. It could neither evolve nor become extinct.

Yet, paradoxically, Linnaeus hoped in vain that he could "tempt" and "train" coffee and other tropical crops to grow in Scandinavian soil. One of his ambitious goals was to create "Lapland cinnamon groves, Baltic tea plantations, and Finnish rice paddies." He also hoped that Sweden could eventually grow cotton and opium.

Some physician-naturalists experimented with botanical medicines in hopes of easing patient suffering. They were "bio-prospectors," similar to today's scientists who look for medicinal compounds in biologically rich places such as coral reefs or rainforests.

There was intense competition for the most valuable botanicals and methods of cultivating them. For example, *Cinchona officinalis*, also known as Peruvian bark, was the source of quinine, the first effective anti-malaria medicine, and it remained the medicine of choice for three centuries. But Spanish colonists in the New World closely held secrets

about the best varieties and how to cultivate them successfully. In the 1800s, South American countries outlawed trade of Peruvian bark seeds in order to hold a monopoly.

For the most part, however, naturalists thrived on a remarkably free exchange of specimens and scientific knowledge. They were avid scribblers, writing streams of letters, debating and sharing insights with colleagues around the world. An epistolary network of natural historians stretched from London to Paris to Zurich to Berlin to Philadelphia and Charleston. Naturalists belonged to the era's most prominent intellectual global network: many hundreds of people who collaborated to understand natural wonders.

The first scientific journals emerged from the tradition of exchanging knowledge in learned societies and correspondence. Some journals today have names that are reminders of that era: *Geophysical Research Letters* and *Ecology Letters*.

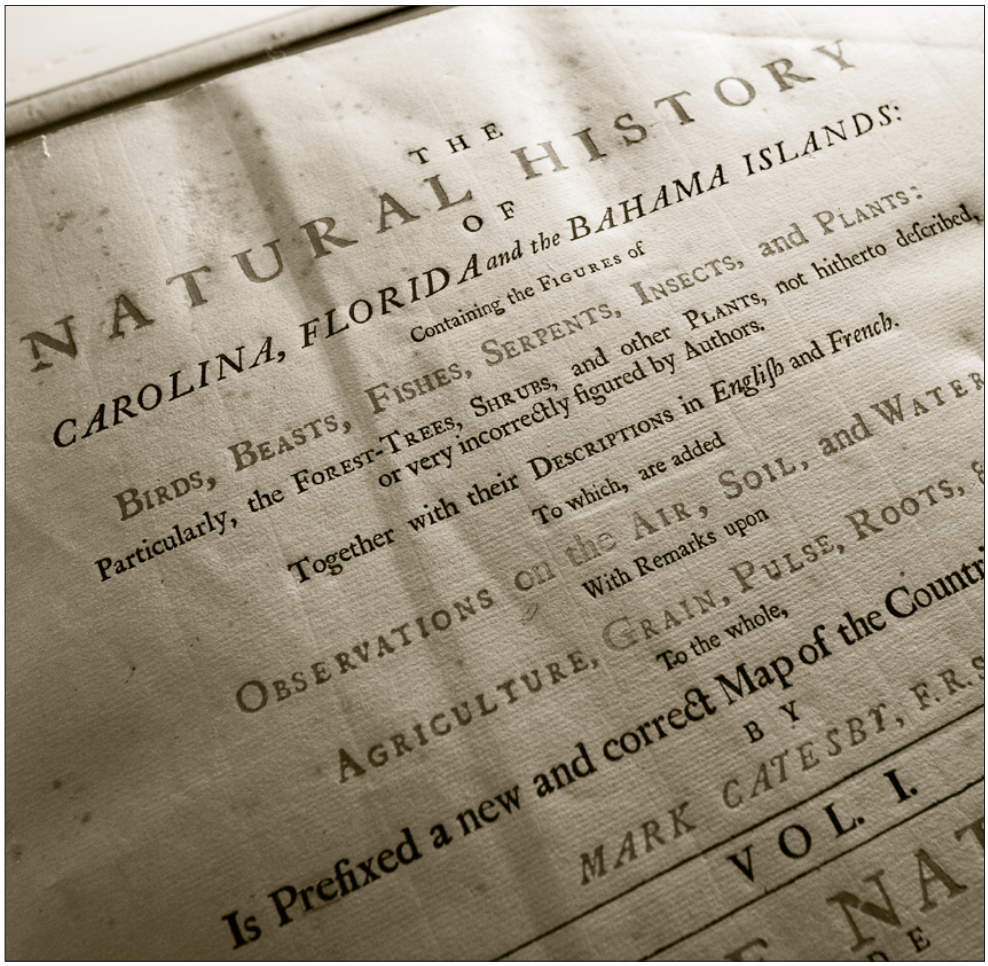
European scientists especially hankered after biological specimens from the southern colonies of British North America and the Caribbean, where climates, habitats, and species were so different from those of Europe.

"What Europeans were most blown away by was the stuff in America that was not like what they would see in Europe," says Mancke. Descriptions and drawings of rattlesnakes and alligators were especially exciting to Europeans, who had no experience of such creatures.

Old World naturalists requested specimens from sea captains, politicians, ministers, merchants, planters, and even slaves and Indians. Collectors also commissioned explorers to enter the southern backcountry and look for rare specimens.

Colonists who hoped to join the global network of naturalists would boast of their access to interesting specimens. Alexander Garden of Charleston wrote to Linnaeus: "We have many plants wild in the more southern colonies which cannot bear the climate of the northern provinces."

To learn more about the South, Europeans sponsored a series of adventuring naturalists to explore the region. One of the first was the Englishman Mark Catesby.



TIME CAPSULE. ***In his groundbreaking book, completed in 1743, Mark Catesby offered the most comprehensive description of American wildlife of its time.***
PHOTO/WADE SPEES

CATESBY IN CAROLINA

Mark Catesby had a knack for being in the right place at the right time. In his youth, he met important English naturalists through family connections, including John Ray, an eminent botanist who was the first to develop the modern concept of species.

In 1712, Catesby, age 29, sailed across the Atlantic to stay with his sister and brother-in-law in Virginia. Supported by a family inheritance, he remained in America for seven years, collecting botanical specimens and observing nature. He shipped many specimens to England, which got into the hands of members of the Royal Society.

Upon his return to England, Catesby was introduced to Royal Society members, who raised funds to send him back to America's southern colonies to explore its natural history. Catesby would have to enter often-contested territory. In 1711, Tuscarora Indians had killed the English naturalist John Lawson, believing he was trying to steal their land.

After a three-month sea voyage, Catesby reached Charleston in May 1722. Traveling on foot, the Englishman headed south along the coast. Often relying on Indians for food and shelter for the next four years, he explored regions little

known to Europeans. He endured a hurricane, an experience that frightened him. Catesby made drawings and paintings on the spot, which were shipped across the Atlantic. He also sent live plants, seeds, bird skins, stuffed fish, and other specimens.

Catesby was the first naturalist to draw indigenous plants as backgrounds for his birds and animals, his efforts anticipating the later work of William Bartram and John James Audubon.

After returning to England in 1726, Catesby worked for the Royal Society in various capacities and labored on the book that would offer a more accurate picture of American flora and fauna than anyone had attempted up to that time. He painstakingly taught himself engraving for the plates of his book, *The Natural History of Carolina, Florida, and the Bahama Islands*, the first volume of which was published in 1732. The second volume followed in 1743. Although Florida was included in the title, the region he explored was actually in present-day Georgia.

His book was the first published account of the flora and fauna of North America, including 220 plates of birds, reptiles, amphibians, fish, insects, and mammals. Catesby's engravings and descriptions of New World wildlife fascinated not only Europeans but also many Americans, who were beginning to appreciate the natural features of the places they called home.

Catesby won praise from influential readers, including Royal Society members, who admired his detailed artwork and descriptions of nature and native peoples. Because he was born in Britain and returned there after his explorations, he was seen as untainted by colonial connections, and he was invited to join the Royal Society.

In the eighteenth century, studies of the natural world often appeared in essays, poems, travel narratives, and in a popular literary form called the "natural history." Catesby's book is an example of a natural history that describes the flora, fauna, and local inhabitants of a particular region and includes drawings or engravings.

To Catesby, the southern colonies seemed to have inexhaustible natural resources. Exploring coastal rivers from Virginia to Carolina, he found spectacular biological wealth. "At low water there appears in the Rivers and Creeks immense Beds of Oysters, covering the muddy Banks many Miles together; in some great Rivers extending thirty or forty miles from the Sea; they do not lie separate but are closely joined to one another, and appear as a solid Rock a foot and half or two Feet in Depth, with their Edges upwards."

Historians have long known that the Chesapeake region had massive, extensive oyster reefs in the eighteenth century. Anecdotal information suggests that Catesby was telling the truth about Carolina having such riches, too. Ship logbooks in the late 1600s and 1700s describe extensive "live rock," which were often oyster reefs, throughout the lower Cape Fear estuary in North Carolina. The live rock was a major impediment to navigation, according to Martin Posey, a marine biologist at the University of North Carolina at Wilmington.

NEW WORLD CURIOSITY. ***The early naturalist Mark Catesby drew this image of* Pelicanus americanus, *known then as the Wood Pelican but now as the American White Pelican.***
DRAWING/UNIVERSITY OF WISCONSIN DIGITAL COLLECTIONS

"Catesby's book was incredibly well done," says Mancke, "and his work affected so many naturalists and brought so many people into the regions that he visited. He made people aware of the variety in a relatively small space, and they wanted to come and see it for themselves. His book was read all over the world."

Catesby was honored particularly for his illustrations of birds. Later, though, Audubon and the American ornithologist Alexander Wilson overshadowed Catesby, and his book was almost forgotten until the latter part of the twentieth century, when historians and naturalists began studying his work anew. Today, only 50 original copies of Catesby's book remain in the world, including one at the lowcountry's Middleton Place.

AMERICAN BOTANY AND JOHN BARTRAM

John Bartram was the hard-working patriarch of colonial natural history in the decades leading up to the American Revolution.

A Quaker farmer, he established one of the first botanical gardens in America on 102 acres four miles outside Philadelphia. Between periods of sowing and harvesting, John Bartram made frequent trips throughout the eastern seaboard gathering plants that he brought to his Pennsylvania farm called Bartram Gardens. He often took along his son, William, a gifted artist, who made drawings of plants and animals.

Embracing the Quaker virtues of industriousness and honesty, John Bartram labored at a formidable pace all of his life. Largely self-taught, he found success despite his earthy, unpolished appearance and his lack of formal education. A friend once described Bartram as a "down right plain Country Man."

John Bartram eventually gained a

reputation as the most resourceful and knowledgeable botanist in the American colonies. Along with his close friend Benjamin Franklin, he was a founding member of the American Philosophical Society, the colonial version of the Royal Society of London. Bartram also cultivated contacts with scientists in Europe, including Linnaeus.

In the early 1740s, he wrote to Mark Catesby, who had published the first volume of his book: "It is a pity thee had not wrote to me ten years ago. I should by this time have furnished thee with many different species of plants and perhaps some animals . . . therefore, pray, write often to me and inform in every particular what thee wishes of me, and wherein I can oblige thee; for when I am traveling on the mountains or in the valleys, there most desolate, craggy, dismal places I can find, where no mortal ever trod, I chiefly search out."

For all his importance and talent as a naturalist, John Bartram was a clumsy writer at a time when scientists were expected to cultivate a measure of literary grace and rhetorical skill. Scientists debated and conferred frequently by correspondence, and the written word was crucial to the advancement of science and individual reputations.

Colonials, however, were held to a lower standard of sophistication. Bartram was defiantly proud of his rough edges, which he thought signaled honesty and authenticity. Although some Europeans looked down their noses at the Quaker farmer, he was nevertheless held in esteem for discovering and introducing many rare and previously unknown plants to the scientific community.

In Europe, Bartram found a lucrative marketplace for plants that he'd collected in the wild and cultivated on his Pennsylvania farm. He primarily shipped woody plants—trees and shrubs—and seeds of perennials wrapped in moss to influential European landscape gardeners who were eager to receive exotic species from the New World, including sweet gum, mountain laurel, swamp azalea, and many others. For several years in a row, the Prince of Wales bought Bartram's botanicals, which cost five guineas a box.

Bartram Gardens was responsible for introducing one-third to one-half

TRAVELS. ***A 1791 map of East Florida drawn by the American naturalist William Bartram. William traveled through East Florida in the 1760s with his father, the naturalist John Bartram. A decade later, William returned, by himself, to the region and subsequently wrote an American classic based on his adventures and natural-history explorations.***

DRAWING/THE UNIVERSITY LIBRARY, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

of all North American plants into Europe from 1730 to 1770, according to a 2007 book by Judith Magee with the Natural History Museum in London.

By the mid-eighteenth century, the southern colonies of British North America were still an unexplored resource for the horticulture trade. Species that many South Carolinians today take for granted as common features in the landscape were still unknown outside the South. So Bartram was eager to collaborate with naturalists in South Carolina, where nature produced so many unfamiliar species.

In the 1750s, a leading naturalist of Charleston, Alexander Garden, shipped lowcountry plants and seeds—magnolia, indigo, dahoon holly, and swamp palmetto, for instance—to Bartram and other northerners.

In 1760, John Bartram paid his first visit to Charleston and was dazzled by species he encountered there. "I have been lately in the woods for two hours with John," Alexander Garden wrote to a mutual naturalist friend, and "he seems almost ravished of his senses and lost in astonishment."

Four years later, Bartram received a stipend from British royalty to continue his exploring and specimen collecting. With the aid of Benjamin Franklin, who was in London representing the colonies, Bartram was named the king's botanist for Florida with an annual compensation of 50 pounds. The new position and funds gave Bartram what he needed to explore the St. John's River of Florida.

The Seminoles and their king, Long Warrior, called William Bartram "Puc-Puggy," or Flower-Hunter. **DRAWING/THE UNIVERSITY LIBRARY, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL**

In July of 1764, Bartram arrived in Charleston to begin an exploration of the coast south to the St. John's River. But, at age 67, John Bartram was seasick from the journey, and asked his son William to join the expedition as his assistant. John contracted malaria on the trip and often depended on William to write diary entries about species they collected.

William's participation was fortuitous in another way—it introduced him to the southern colonies, a region that later gave him the opportunity to make his name as a scientist.

Surprisingly, it was shy, mild-mannered William—not hard-charging, ambitious John—who became the most influential naturalist-explorer of early America.

THE ARTIST EXPLORER

William Bartram as a youth was so diffident and apparently impractical that his father despaired about his future. On specimen-gathering trips with his father, William learned to discern nature's variety and detail. Father and son were boon companions. But John worried that his son was spending too much time drawing plants and animals as he grew into adulthood.

William hoped to continue drawing wildlife as an occupation, but his father said that wouldn't do. Instead, the young man needed "a temperate reasonable living."

After receiving a classical education at the Philadelphia Academy, later to become the University of Pennsylvania, William failed in business apprenticeships arranged by his father. Alexander Garden offered to take on William as an apprentice in his medical practice, though nothing came of it.

Lacking confidence, the young man continued to drift. In 1766, William's father bought him a site for a rice plantation on the St. John's River in Florida. But William, then age 27, failed at that, too—his father had given him six slaves, but only two of them, said

Charles Willson Peale painted this oil portrait of William Bartram in 1808. **SOURCE/THE NEW GEORGIA ENCYCLOPEDIA, 2008**

William, could handle an ax to clear the land. William wasn't the sort of person who could whip slaves to make them work.

After almost a year, William abandoned the Florida site and moved to Philadelphia, where he worked as a day laborer. In his spare time, the young artist sent his drawings to English naturalists, capturing the attention of John Fothergill, a wealthy physician, gardener, and friend of his father's. Fothergill was enthusiastic about William's talent and suggested sponsoring him on a botanical exploration of the Canadian frontier. William would gather specimens, and draw and describe what he found.

But William had a different idea for a frontier expedition, and he dug in his heels. William wanted to return to the southern colonies, this time on his own. Fothergill finally agreed and asked Dr. Lionel Chalmers of Charleston to act as agent. Chalmers

would issue William 50 pounds a year, which was the salary of John Bartram as king's botanist.

John Bartram, though, was unhappy with his son's venture, calling it "a wild notion."

William sailed to Charleston, and then from March 1773 to January 1777 he traveled through a region that would become eight modern states: North and South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana. Although most of his travels were on the coastal plain, he also explored the foothills of the Appalachian Mountains.

Throughout this trip, he depended on the advice and company of traders who were licensed by colonial governments. For deerskins, traders bartered manufactured goods from Europe and the Caribbean. William stayed with planters and traders, accompanying them on visits to Creek and Cherokee towns and settlements.

In the spring of 1776, William was briefly caught up in an early battle of the American Revolutionary War at Darien, Georgia. That year, as violence increased, he started for home, arriving safely at his father's Pennsylvania farm in January 1777. Nine months later, John Bartram died.

William settled on the farm, which a brother had inherited, and wrote his book, *Travels through North and South Carolina, Georgia, East and West Florida.*

During the 14 years that William Bartram worked on *Travels*, the American Revolution was won, a new nation born, and the Constitution written and ratified. Thomas Jefferson, meanwhile, was arguing that the United States should shake off European dominance in scientific affairs. Jefferson considered it a patriotic duty for Americans to pursue taxonomy, the naming and describing of plants and animals in the United States. National pride and identity were at stake.

Published in 1791, William Bartram's *Travels* was a brilliant success first in Europe

CONNECTIONS. ***In 1791, the American naturalist William Bartram published his* Travels, *which brought him international recognition. In his book, Bartram often illustrates species in isolation from their habitat in accordance with scientific protocols of his day. Notice that the image of* Andromeda pulverulenta *(right) is shown alone. He is more admired today, though, for his understanding and descriptions of the complex interactions between species and habitats.***

DRAWING/THE UNIVERSITY LIBRARY, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
PHOTO/WADE SPEES

and later in the United States. Readers were excited by this American naturalist's drawings and stories of frontier adventure—of giant, aggressive alligators stalking his campsite and of a diamondback rattlesnake William killed—and his lyrical descriptions of nature.

His literary and artistic skills brought him fame and made his book an American classic. British Romantic poets William Wordsworth and Samuel Taylor Coleridge read him with intense interest, and Coleridge borrowed phrases from Bartram's book.

Bartram describes the flight of a flock of birds that he calls savanna cranes, now called Florida sandhill cranes. They "spread their light elastic sail: at first they move from the earth heavy and slow; they labor and beat the dense air; they form the line with wide extended wings; tip to tip, they all rise and fall together as one bird; now they mount aloft, gradually wheeling about; each squadron performs its evolution, encircling the expansive plains."

He patiently made a drawing of one sandhill crane, then shot it, cooked it, and ate it for supper.

At the entrance of a lagoon of the St. John's River, he observes huge numbers of "trout," which were likely large-mouth bass, swimming down the river. The river, Bartram writes, "appeared to be one solid bank of fish of various kinds, pushing through this narrow pass of St. Juan's into the little lake."

Then, from the shallows, alligators attack. "The horrid noise of their closing jaws, their plunging amidst the broken banks of fish and rising with the prey some feet upright above the water, the floods of water and blood rushing out of their mouths, and the clouds of vapor issuing from their wide nostrils were truly frightening."

Throughout *Travels*, he carefully categorizes and labels species in accordance with the scientific protocols of his day. To gain recognition for his discovery of plants, he generally uses the Linnaean method of drawing and description, taking specimens out of their natural context.

He provides more detail and context, however, in other drawings and descriptions, which illustrate how various species fit into their specific environmental settings and habitats.

In a drawing completed in 1774 or 1775, he shows a Bobolink—or rice bird—perched on a rice stalk. A rice seed is held in the bird's beak. Nearby is an immature corn snake, which is attracted to a large fly sitting on a low-hanging leaf of the rice plant. Also nearby is a green tree frog. All of these species were common in southern Georgia and East Florida, and he depicts their various interactions.

Bartram was ahead of his time in showing how species related to and were dependent on their surroundings and on other species. In his understanding of species and habitat interconnections, he foreshadowed principles of ecology that emerged a century later. His descriptions of flora and fauna are remarkably detailed and precise.

"Bartram's *Travels* is a book," says Mancke, "that you can take with you in the field and read what he was describing, and you can see basically the same things that he saw."

William was 52 years old when *Travels* was published, and for the next three decades—until his death at age 84—he was generous in sharing his knowledge with naturalists, philosophers, and writers who visited the Pennsylvania farm. William Bartram lived long enough to see his country's science begin to step from the shadow of Europe's.

The naturalists of early America were different in many respects from natural scientists of today. Few were trained in universities. Their education took place primarily in the field, although they understood scientific classifications of the time. Most were generalists who studied nature in all its forms. And some made lasting reputations as much by their literary and artistic skills as their scientific ones.

Still, Robert Huxley of the Natural History Museum in London points out that modern "natural science was built on the work of those who went before, who braved dangers from tempests . . . to disease and political upheavals in their pursuit of cataloguing and understanding the natural world—these are the great naturalists."

Reading and Web sites

Bartram, William. *Travels and Other Writings*. New York: The Library of America, 1996.

Catesby, Mark. *The Natural History of Carolina, Florida, and the Bahama Islands: Containing the Figures of Birds, Beasts, Fishes, Serpents, Insects, and Plants.* Vol I. London: C. Marsh, 1754. digital.library.wisc.edu/1711.dl/DLDecArts.CateNatHisV1

Cruickshank, Helen Gere, Ed. *John and William Bartram's America: Selections from the Writings of the Philadelphia Naturalists*. Greenwich, Conn.: Devin-Adair, 1990.

Darwin, Charles. *On the Origin of Species*. Cambridge: Harvard University Press, 1964.

Huxley, Robert, Ed. *The Great Naturalists*. New York: Thames and Hudson, 2007.

Irmscher, Christoph. *The Poetics of Natural History: from John Bartram to William James*. New Brunswick, N.J.: Rutgers University Press, 1999.

Judson, Olivia. *"Darwinmania!"* New York Times blog, "The Wild Side," June 17, 2008. judson.blogs.nytimes.com/2008/06/17/darwinmania

Kastner, Joseph. *A Species of Eternity*. New York: Knopf, 1977.

Kirby, Jack Temple. *Mockingbird Song: Ecological Landscapes of the South*. Chapel Hill: University of North Carolina Press, 2006.

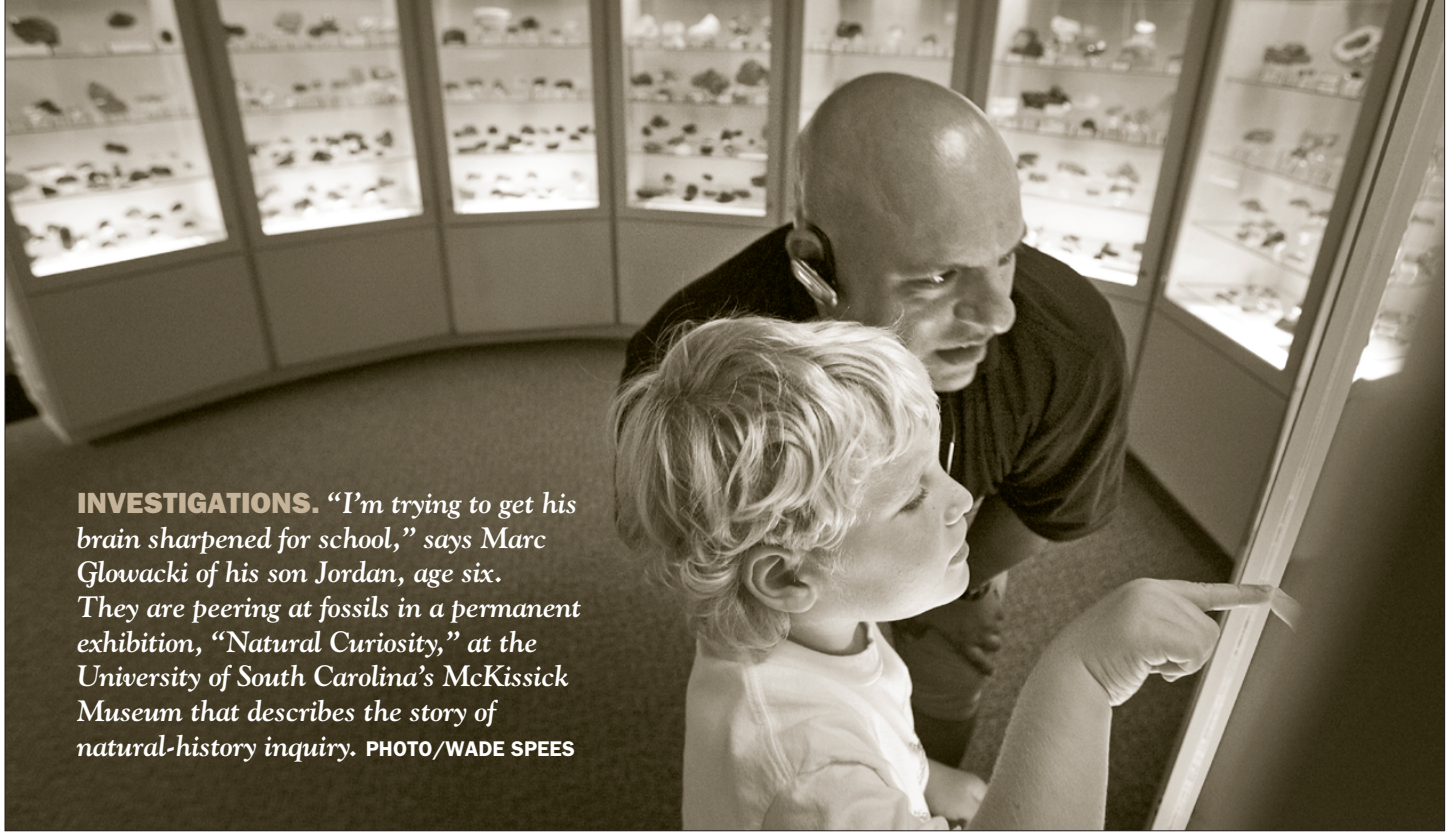
Mabey, Richard, Ed. *The Oxford Book of Nature Writing*. Oxford: Oxford University Press, 1995.

Magee, Judith. *The Art and Science of William Bartram*. University Park: The Pennsylvania State University Press, 2007.

Parrish, Susan Scott. *American Curiosity: Cultures of Natural History in the Colonial British Atlantic World*. Chapel Hill: University of North Carolina Press, 2006.

Sanders, Albert E. and William D. Anderson, Jr. *Natural History Investigations in South Carolina from Colonial Times to the Present*. Columbia: University of South Carolina Press, 1999.

Taylor, David, Ed. *South Carolina Naturalists: An Anthology, 1700-1860*. Columbia: University of South Carolina Press, 1998.



INVESTIGATIONS. *"I'm trying to get his brain sharpened for school," says Marc Glowacki of his son Jordan, age six. They are peering at fossils in a permanent exhibition, "Natural Curiosity," at the University of South Carolina's McKissick Museum that describes the story of natural-history inquiry.* **PHOTO/WADE SPEES**

Where did the missing animals go?

Exploring the southern colonies of British North America during the mid-1720s, English naturalist Mark Catesby visited Stono, a large plantation near Charleston.

Plantation slaves there had dug up "three or four teeth of a large animal," Catesby later wrote, "which by the concurring opinion of the Negroes, native Africans, that saw them, were the grinders of an Elephant."

Catesby agreed with their assessment. He had seen molars of African elephants displayed in London. But no one in the southern colonies, of course, had ever seen a live elephant in America.

When eighteenth-century naturalists studied an unfamiliar fossil, they had a different mental framework than we do today. Most scientists of that time believed that species were breathed into life as perfect things and never disappeared from the Earth. That is, each species was alive at the beginning of life on the planet and would always look exactly the same throughout history.

So when fossils of creatures—mammoths and mastodons, for instance—were excavated, many scientists suspected that those animals must still be living somewhere, having relocated to unexplored regions.

Olivia Judson, an author and research fellow in biology at Imperial College London, compares scientific thinking of the eighteenth century to that of modern times: "Extinction is so much a part of today's cultural background—this species endangered, that habitat lost, save the whale, save the rhino, save the rainforest—that it's strange to think that as little as 200 years ago, most people didn't think extinction was possible. The very idea was an affront to the Creator; it suggested imperfection and incompleteness in the original design of the world."

It was partly a fascination with fossils that helped move European natural sciences into the modern era. In 1800, the French scientist Georges Cuvier completed a study of fossil bones of huge animals including giant ground sloths, mammoths, and mastodons.

Cuvier demonstrated that the teeth of fossil mammoths from Siberia were similar to those of existing elephants in Asia and Africa but belonged to a species unknown anywhere in modern times. The fossil mammoth must be extinct, he argued. (In 1806, Cuvier also translated Catesby's book into French and declared that slaves at Stono Plantation had correctly identified an elephant fossil.)

After considering Cuvier's evidence and arguments, scientists increasingly accepted the principle of species extinction. But what was the relationship between extinct animals and those living in modern times? Many leading naturalists speculated that species evolved, but they didn't know how it occurred.

Vast regions around the world, meanwhile, were being opened by European and American exploitation. In the Americas, new nations, including the United States, were spreading rapidly into Indian territories, and naturalists took advantage of frontier outposts to search for species unknown to science.

Naturalists studied and collected

specimens in tropical forests of South America and the East Indies, where Europeans had established colonies. In Africa, Europeans penetrated deeper into the continent, sending specimens and artifacts home to be studied. In the wake of colonial exploitation, naturalists gathered increasingly large collections of plants and animals from almost every corner of the globe.

Charles Darwin was one of the adventuresome naturalists who rode the wave of colonial expansion. As a young man, he sailed on a voyage of discovery around the world on the HMS *Beagle*. On the trip from 1831 to 1836, Darwin studied fossils in Patagonia and spiders in Brazilian tropical forests, but it was when he reached the Galapagos Islands, a 60-mile-long archipelago off the Pacific coast of South America, that he encountered a feature that would fascinate him the rest of his life.

In his 1845 book, *The Voyage of the Beagle*, Darwin describes how he first learned of the unusual biological variety in the Galapagos, a region where "the different islands to a considerable extent are inhabited by a different set of beings." He was told that giant tortoises, for instance, were different species on various Galapagos Islands. Why would this be so?

Sailing back to Britain, Darwin carried a large collection of plant and animal specimens. At home, poring over his collection and consulting with other naturalists, he realized that ground finches on the Galapagos Islands resembled those of South America. The finches on various Galapagos Islands, however, differed slightly from each other—and from those on the continent—in size and plumage, and especially in the size and shape of beak.

What caused such variety in a relatively small geographic space?

Darwin requested more specimens from natural-history collections and filled his notebooks with observations. He learned that the inhabitants of islands around the world resemble — though differ in subtle ways from — those of the nearest continent. He reasoned that new islands become colonized by species from the nearest continents, and that over time the new inhabitants begin to evolve in separate ways, adapting to different conditions in specific locales.

Darwin's theory of evolution, then, took shape. It had four key parts:

- Creatures of the same species differ from each other in ways that are inherited. This is known as variation.
- More creatures in a population are born than can survive. This is the struggle for existence.
- Some creatures of the same species possess characteristics that give them a better chance of surviving and reproducing than others in that species.
- Those favored characteristics are passed on to future generations. Over a long period, new forms of life evolve.

But Darwin did not publish his findings about evolution for years.

Then, in June 1858—150 years ago—Darwin received a package from a young naturalist, Alfred Russel Wallace, who was working in Malaysia. Wallace enclosed a brief manuscript in which he outlined the principle of evolution by natural selection. Wallace's ideas about evolution matched Darwin's.

This new competitor spurred Darwin to write his masterpiece, *On the Origin of Species*, which describes the theory of evolution.

WINDOW ON HISTORY. ***This fossil of an ancient bison, found on Edisto Beach, is part of a permanent display at McKissick Museum at the University of South Carolina. The early naturalists' collections and analyses of fossils led nineteenth-century scientists to accept the principle of species extinctions.*** **PHOTO/WADE SPEES**

Before Darwin, a species was usually seen as created whole and unchangeable. After his book was published, scientists understood that each species was linked to numerous species that came before.

To write *Origin*, Darwin relied on specimens and knowledge gathered by generations of naturalists around the world. He depended on the efforts of many hundreds of scientists who had investigated European species and explored Asia, Africa, the Pacific Rim, and the Americas, including naturalists who visited the southern colonies of eighteenth-century British North America, among them Mark Catesby, John Bartram, and William Bartram.

In *Origin*, observes Judson of Imperial College London, Darwin "discusses subjects as diverse as . . . the rudimentary eyes of cave fish, the nest-building instincts of honeybees, the evolving size of gooseberries (they've been getting bigger), wingless beetles on the island of Madeira, and algae in New Zealand."

Darwin appealed to the practical experience of his readers, who understood the power of selective breeding to produce new characteristics in plants and animals. In *Origin*, Darwin asks, "As man can produce and certainly has produced a great result by his methodical and unconscious means of selection, what may not nature effect?"

He published six editions of *Origin* in his lifetime, continually revising and refining as he consulted new data from his own specimen collections and those of his naturalist colleagues. Darwin's book opened up so many new, productive lines of inquiry that the natural sciences became more professionalized and specialized—and then sub-specialized—to address them. With *Origin*, the era of the amateur naturalist leading scientific discovery effectively came to an end.

Next year, 2009, is the 200th anniversary of Darwin's birth. It is also the 150th anniversary of the publication of *Origin*. Scientific communities around the world will celebrate his achievement.

Today, Darwin and Wallace's theory of evolution by natural selection continues to be the basis of all biological science, explaining nature's diversity and complexity.

NEWS & NOTES

Greenberg elected as Consortium board chair

Dr. Raymond S. Greenberg, president of the Medical University of South Carolina (MUSC), has been elected as chair of S.C. Sea Grant Consortium's Board of Directors. He began his one-year term in October 2008.

Raymond Greenberg, M.D., Ph.D.
PHOTO/MUSC

Greenberg became president of MUSC in January of 2000. Prior to coming to Charleston, he served on the medical school faculty at Emory University and was the founding dean of the Rollins School of Public Health there. He arrived at the Medical University in 1995 as the vice president for academic affairs and provost.

He holds a medical degree from Duke University, a master's degree from Harvard, and bachelors and doctoral degrees from the University of North Carolina. Nationally recognized for his research on cancer, Dr. Greenberg has served on many scientific advisory boards and holds two honorary doctorates.

"We are extremely pleased that Dr. Greenberg has assumed the chairmanship of the Consortium's board," said M. Richard DeVoe, executive director of the Consortium. "His leadership and guidance will be instrumental as the Consortium pursues opportunities for relevant coastal and ocean research and outreach efforts that address the ever-growing needs of the state and its people."

Coastal climate specialist joins Sea Grant

Jessica Whitehead has joined the S.C. Sea Grant Consortium Extension Program as the regional coastal climate extension specialist. She received her B.S. in physics with a concentration in meteorology from the College of Charleston in 2000 and her M.S. in meteorology from Pennsylvania State University in 2003. She is finishing her Ph.D. in geography at Penn State, which will be conferred in May 2009.

Although Jessica is based in the Consortium office, her position is jointly managed by the North Carolina Sea Grant and the Carolinas Integrated Sciences and Assessment (CISA) project at the University of South Carolina.

As a part of this Regional Coastal Climate Change Initiative, she is developing outreach programs for decision-makers along the South Carolina and North Carolina coasts to provide them with tailored, decision-relevant information about the impacts of climate variability and long-term climate change on coastal areas.

Her current efforts include conducting a needs assessment for potential information users that will help Sea Grant determine what decision-makers need to understand about climate.

She is also developing a series of "Frequently Asked Questions" (FAQ) fact sheets designed to answer decision-makers' questions about climate science and the impacts of climate variability and change at a general audience level. These FAQ fact sheets will be available on both the S.C. Sea Grant Consortium and N.C. Sea Grant Web sites. Additionally, Jessica assists with CISA research efforts and the grass roots effort to establish a national Sea Grant climate extension network.

Jessica Whitehead
PHOTO/S.C. SEA GRANT CONSORTIUM

"People can continue to debate about the causes, but the fact is that the climate as humans know it is changing," Jessica said. "As the population along the North and South Carolina coasts grows, it becomes even more important that we address the impacts natural climate variability and human-induced climate change will have on our lives. My purpose is to make climate science useful and relevant to coastal users. At the end of the day, if elected officials or business owners can understand more about hurricane intensity or sea-level rise and then tell me what they need to do to minimize those impacts on their beaches or maximize benefits that increase their profits, then I will have done my job."

NEWS & NOTES

Applications analyst joins Consortium

Barry Girsh has joined the S.C. Sea Grant Consortium as an applications analyst. He is creating data-driven Web sites and Web-based applications that allow non-technical users to maintain their own content—images and words—and create new content. He is also creating forms that allow users to request subscriptions for publications and submit research abstracts, as well as developing Web 2.0 applications such as blogs and podcasts.

Barry Girsh
PHOTO/S.C. SEA GRANT CONSORTIUM

He has a Bachelors of Architecture from Syracuse University. He was previously a web developer at the NOAA Coastal Services Center in Charleston, S.C., and an archaeological illustrator for the Metropolitan Museum of Art in New York City.

Nominations sought for 2008 S.C. Environmental Awareness Award

Nominations will be accepted through December 15, 2008 for an award to recognize South Carolinians who are doing extraordinary work for the natural environment. Guidelines and nomination forms for the S.C. Environmental Awareness Award are available at www.dnr.sc.gov/awards/environmental.html. For more information, contact Priscilla Wendt at (843) 953-9305 or wendtp@dnr.sc.gov.

The S.C. General Assembly established the S.C. Environmental Awareness Award, now in its 17th year, during the 1992 legislative session to recognize outstanding contributions made toward the protection, conservation, and improvement of South Carolina's natural resources.

Each year the public is invited to submit nominations that are then reviewed by an awards committee, which includes representatives from the state's environmental and natural resource agencies. In judging nominees, the committee considers excellence in innovation, leadership, and accomplishments that influence positive changes affecting the natural environment.

Members of the awards committee represent the S.C. Department of Natural Resources, S.C. Department of Health and Environmental Control, S.C. Forestry Commission, and S.C. Sea Grant Consortium.

Richard Porcher, Jr., Ph.D. was named the winner of the 2007 S.C. Environmental Awareness Award.

An emeritus professor of botany at The Citadel, Porcher is the author of several books, including *A Guide to Wildflowers in South Carolina*, and more than 30 scientific papers.

Previous award winners are:

2006 – **Rick Huffman**, founder, South Carolina Native Plant Society

2005 – No winner

2004 – **John L. Knott, Jr.**, president, Noisette Company, North Charleston

2003 – **Burris Family**, owners, Cypress Bay Plantation Tree Farm, Beaufort

2002 – **Dr. Jack Turner**, director, Watershed Ecology Center, University of South Carolina

2001 – **James D. Elliott, Jr.**, founder, South Carolina Center for Birds of Prey

2000 – **Dr. Dave Hargett**, conservationist, Greenville

1999 – **Kenneth Strickland**, environmentalist, Florence

1998 – **Yancey A. McLeod, Jr.**, environmental educator, Eastover

1997 – **Brad Wyche**, president, Friends of the Reedy River, Greenville

1996 – **Beaufort County Clean Water Task Force**

1995 – **Dr. Whitfield Gibbons**, senior research ecologist, Savannah River Ecology Laboratory

1994 – **Marion Burnside**, chairman, S.C. Department of Natural Resources

1993 – **Dana Beach**, executive director, S.C. Coastal Conservation League

1992 – **Rudy Mancke**, naturalist, S.C. Educational Television

EBBS & FLOWS

2008 American Geophysical Union Fall Meeting

San Francisco, California
December 15-19, 2008

The 2008 American Geophysical Union (AGU) Fall Meeting is expected to draw a crowd of over 15,000 geophysicists from around the world.

The meeting provides an opportunity for researchers, teachers, students, and consultants to present and review the latest issues affecting the Earth, the planets, and their environments in space.

To learn more about AGU and associated conferences, visit www.agu.org.

Eighth Annual New Partners for Smart Growth: Building Safe, Healthy, and Livable Communities

Albuquerque, New Mexico
January 22-24, 2009

Join us in January 2009 in the beautiful state of New Mexico for the latest in smart growth—the most current research, cutting-edge implementation tools and techniques, best practices, model projects, policies and codes, coordinated networking activities, interactive learning experiences, and new partners.

For more information, visit www.newpartners.org.

Coastal GeoTools

Myrtle Beach, South Carolina
March 2-5, 2009

Coastal GeoTools is the conference series that focuses on the technical information needs of the nation's coastal programs.

The theme for 2009 is "Building the Digital Coast," a new initiative that provides easy access to organized and relevant data, tools, and technical training.

The opening plenary session will be hosted by the Digital Coast Partners and will provide their perspective on the importance of geospatial technologies to their constituents.

For more information, visit www.csc.noaa.gov/geotools.

Subscriptions are free upon request by contacting: Annette.Dunmeyer@scseagrant.org

ATTENTION SCHOOL TEACHERS! The S.C. Sea Grant Consortium has designed supplemental classroom resources for this and past issues of *Coastal Heritage* magazine. *Coastal Heritage Curriculum Connection*, written for both middle- and high-school students, is aligned with the South Carolina state standards for the appropriate grade levels. Includes standards-based inquiry questions to lead students through explorations of the topic discussed. *Curriculum Connection* is available on-line at www.scseagrant.org/education.

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