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Deep Secrets

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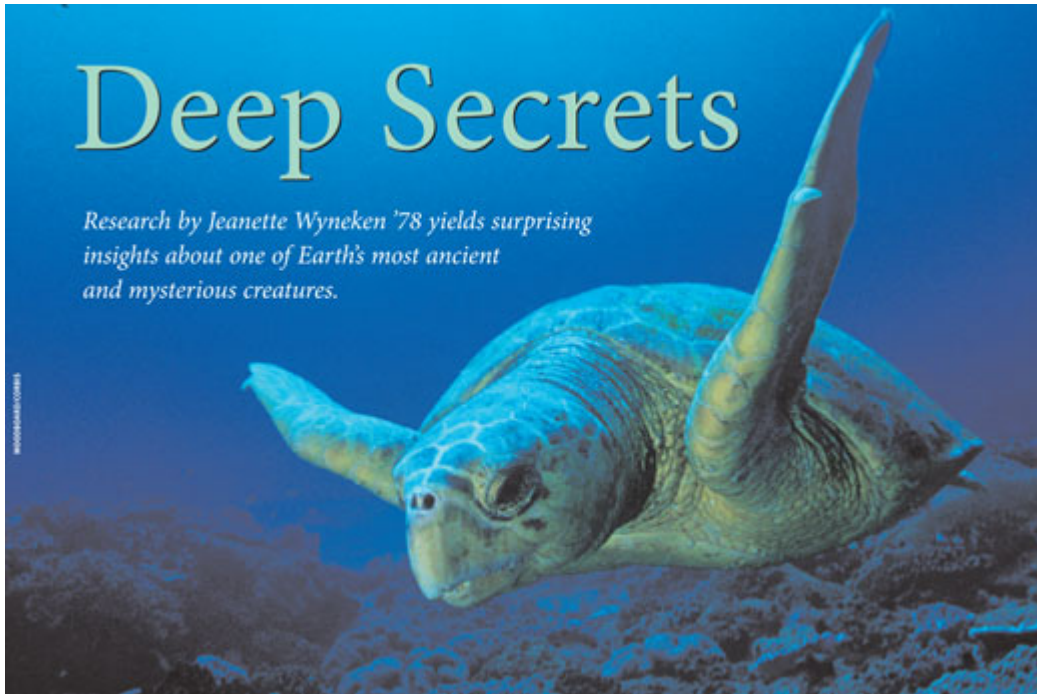
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Story by **RACHEL HATCH**

Under the inky blackness of a new moon, waves slip onto the shores of the Atlantic Ocean — dissolving the soft sand under the bare feet of a small group pacing along the beach. “A perfect night,” sighs one of them. “No bugs, no heat —”

“And no turtles,” interrupts another.

It has been a long night of waiting. Volunteers for the Loggerhead Marinelife Center stroll the Florida sands of Juno Beach, trying to discover any sign of the female sea turtles who make their way to the dunes to lay their eggs from May through August.

And then, in the faint shadows of the night, a dark figure looms above the crashing waves.

“This could be it,” says Jeanette Wyneken, her hands reaching for a night scope. The figure raises its head, peering at the black shore, then turns and disappears back into the sea.

“There will be others,” Wyneken promises ...



Jeanette Wyneken grew up in landlocked Lincoln, Ill., where the ocean’s mysterious creatures existed only in books and in her youthful imagination. Today, with an ocean nearly at her doorstep, she looks back on the journey of time and miles that has transformed her into one of the world’s most respected authorities on sea turtles.

“Why did I choose turtles?” Wyneken ponders the question in her office at Florida Atlantic University (FAU), a public research university located in Boca Raton, just a few blocks from the Atlantic Ocean. “You know, I think it was the closest I could get to dinosaurs,” she answers with a laugh.

Wyneken reaches for the toy *Apatosaurus* perched on the ledge of her window. The view looks out onto the sprawling campus of FAU, where she is an associate professor of biological sciences. She notes that the earliest known sea turtles appear in the fossil record in the Late Jurassic period, some 170 million years ago — a time when the evolution of some of the largest and most famous dinosaurs also took place.

“When I was about 4 or 5,” Wyneken recalls, “I told my mother that I wanted a pet dinosaur. She had to kindly explain there were none around to be had — but let me know I could have a pet turtle.”

Her mother took her to Bloomington’s Miller Park Zoo, which at that time gave away Red-Ear Sliders — the kind that used to be sold as pets in dime stores. “I still have most of those original turtles,” says Wyneken. “One lived to be 29 years old.”

Wyneken’s passion for her research is on display in her office, where artists’ renditions of turtles and other reptiles fill the walls. “My mother was an art teacher. I loved art and had an easy time seeing things in three dimensions. I think that really gave me a good eye as a morphologist,” says Wyneken, speaking of her role as a student of the anatomy and structure of reptiles, especially sea turtles.

Amid papers and books piled on her desk is the May 2009 *National Geographic*, featuring an article about the largest of all living sea turtles, the leatherbacks, which grow up to seven feet long and can weigh more than 1,000 pounds. The article quotes Wyneken, who also served as a consultant on the story’s illustrations.

It’s no coincidence that Wyneken has set up her research shop in Florida, where every spring, during sea-turtle nesting season, thousands of the creatures return to the beaches where they were born to lay eggs. The state’s beaches are one of the primary



Miles off the coast of Boca Raton, Jeanette Wyneken holds a young loggerhead turtle that will be sent back to the ocean with a transmitter attached to help gather data on the elusive sea turtles. (Photo by Jim Abernethy)

nesting grounds for loggerhead sea turtles — although scientists and conservationists have noted a dramatic drop in nest numbers in recent years.

All sea turtle species are listed as threatened or endangered. However, they once inhabited the world's oceans in legions too numerous to count. “Columbus’ ship logs describe them as so numerous that one could almost walk to shore on the backs of turtles,” says Wyneken. In the past 100 years, human factors such as accidental capture in commercial fisheries, beach development and pollution have caused their numbers to dwindle. That fact gives a sense of urgency to Wyneken’s research — which has already helped conservationists understand, and find methods to help reverse, declines in sea-turtle populations.

From her office bookshelf, she pulls out a spiral-bound book and flips to several illustrations, some drawn by her. It is her 2001 book, *The Anatomy of Sea Turtles*, now considered a standard reference. “I like to think of it as a guide to what’s inside,” she says.

When publishers asked to print a hardcover version, she balked. “I wanted something that could be used in the field,” says Wyneken, who has spent many days and nights on beaches across the world studying turtles. “It has to be able to be rolled up and fit into a backpack.”

Wyneken later did co-edit two hardcover books: *Biology of Sea Turtles, Vol. 2* in 2003 and *Biology of Turtles* in 2007. As she writes her fourth book, a definitive reference on reptilian anatomy, she is making use of imaging technologies such as CAT scans and MRIs. These tools help her explore reptilian skeletal elements and internal organs, trace blood flow and identify anatomical positions and landmarks of structures in their entirety. The work is coming along slowly. “You need healthy animals to study,” she says, “and sometimes they are hard to come by.”

As a researcher of species that are sometimes endangered, Wyneken refuses to obtain healthy animals for dissection. “When you deal with animals, especially endangered species, it’s best to have them walk away from the table after you examine them.” When dissection is required, Wyneken works with veterinarians, zoos and others who deal with animals that are set to be euthanized, or have not made it through surgery.

At present, the corpse of a giant python occupies a table in her lab at FAU. Students helped her remove the skin before heading to the muscles. “I’ve been up to my elbows in python for the past week,” Wyneken says. The snake — nicknamed “Big Bertha” by her students — was donated by a state worker who helps capture the non-native pythons now threatening a host of native animal species in Florida’s Everglades.



Wyneken — along with student Angie Stiles and Kate Mansfield of NOAA Fisheries — ready loggerhead turtles for release into the ocean, attached with tags that will track where they travel. (Photo by Jim Abernethy)

research and biology as a career.” She remembers her anatomy teacher, Dorteia Franzen, as “a stern sort who knew her stuff. We all worked hard to avoid her wrath, and learned a lot.”

“More than anything, they taught me how to think — how to use many pieces of diverse knowledge — and find ways to connect ideas. I still use that in my teaching and in my science,” she says.

A professor’s book recommendation during her junior year helped Wyneken discover her scientific path. The volume was by Thomas Frazzetta, an evolutionary biologist and morphologist at the University of Illinois at Urbana–Champaign. “I was fascinated and wrote to him, asking him to take me on as a graduate student,” she says, showing a hint of surprise at her own assertiveness. “I think he was intrigued.”

As a graduate student, Wyneken followed Frazzetta to Florida on a research trip. While he was working on sharks, his study animal, she found herself fascinated by her old friends, the turtles. After earning her doctorate at the U of I, she headed south and dedicated herself to her life’s work.



The group splits up to cover more of the beach, each walking a distance with eyes pulled to the sand, pausing and trying to distinguish clumps of Sargassum seaweed from possible turtles.

“I see tracks!” a voice hisses over a walkie-talkie, and the volunteers move toward indentations in the sand that look like they were carved with a tractor tire.

“See that?” says Wyneken, the normal volume of her voice cutting through the group’s cautious murmur. Because turtles hear only at low frequencies, she’s aware that her words come across as little more than a slight vibration.

Wyneken admits that probing reptilian remains was not high on her agenda when she started as a first-year student at Illinois Wesleyan in 1974. “When you enjoy biology, high school advisors think you should be a physician or a veterinarian,” she says. “I leaned toward veterinarian.” At Illinois Wesleyan, Wyneken was flabbergasted when she learned that her assigned advisor was Professor of Biology Jonathan Dey, a specialist in plants and lichen.

“I thought, ‘They are giving me the plant guy? How can he help me in vet choices?’”

Wyneken soon found Dey’s advice — as well as guidance from other biology professors, including Bruce Criley and Bob Hippensteele — invaluable. “They introduced me to

Wyneken points to the irregular track before her. “I’ll bet she is missing a leg,” she deduces. A glance through the night scope proves her correct, as a massive turtle hobbles to find just the right spot to dig into the dune for the 100 or more eggs she is carrying.

After several breathless moments, the three-legged turtle turns and heads back to the sea, considering the dune unfit for her bounty.

Disappointed sighs ripple through the group. They step away to let the turtle pass, but Wyneken remains in place.

“Watch this,” she says. As the behemoth animal crosses in front of her, she reaches down to run her hand gently along the shell. A soft, green light explodes, leaving a glowing trail where Wyneken has brushed her fingers. “It’s the bioluminescence— light-producing organisms in the ocean that attach themselves to the shells,” she explains.

“People see the ocean as some giant space with fish in it, but really it is teeming with life on every level,” she adds, her voice in full teacher mode. The awed group watches the turtle meander back to the water ...



Wyneken, who is often asked to lend her expertise about what makes sea turtles tick, intently reads an e-mail on her computer screen. “This is typical of the queries I get,” she says, showing the note from a veterinarian that includes a CT scan revealing a large tumor behind a turtle’s right eye. “That will be a tricky surgery,” Wyneken nearly whispers to herself as she types a reply of suggestions she hopes will help.

For Wyneken, such contacts are often mutually beneficial. Perhaps her most important contribution to her field was sparked at a conference in the early 1990s where she addressed a group of veterinarians. Later, she mingled with a smaller group of doctors as they discussed the possibility of small-scale laparoscopic surgery (operations performed through tiny incisions) for animals. “A light went off for me,” says Wyneken, “and I thought, ‘Why not?’” She decided to try using the new technique on young sea turtles with the aim not of fixing illnesses, but of uncovering mysteries hidden underneath their hard shells.

One such mystery has been how many male and female sea turtles hatch each year. “That’s because sea turtles do not show a hint of their sex-specific body form until around age 25,” Wyneken explains, making the determination of young sea turtles’ sex nearly impossible without dissection. Using laparoscopic procedures, Wyneken discovered a way to determine a turtle’s sex, while doing no harm to the animal, when it is only three or four months old.

The technique enabled Wyneken to show a link between sand temperature and whether a turtle is born male or female — something long suspected but never firmly proven. “The hotter the temperature of the sand where a turtle lays her eggs, the more likely that her offspring will be female,” says Wyneken. “We call it hot babes and cool guys.” The discovery was met with excitement as she shared her findings at symposia and conferences throughout the world.



A volunteer feeds baby leatherback turtles at Gumbo Limbo Nature Center. The center is home to Wyneken’s laboratory, one of the few in the world to study and then release baby sea turtles. (Photos by Rachel Hatch)

“She’s literally pioneered a whole new field,” says Mike Salmon, Wyneken’s husband and fellow turtle researcher.

“She is showing how anatomy has ramifications for conservation and management of the species.” Salmon points to a recent conservation effort in Malaysia, which, until recently, was one of only seven countries in the world where leatherback turtles landed to nest in any numbers. Considered a culinary delicacy, turtle eggs are collected by poachers. To protect the eggs, conservationists tried transporting leatherback nests to hatcheries. “But they were keeping the nests too hot, and producing only females,” Salmon says. “It ended up upsetting the natural dynamic as much as the poachers would. Jeanette’s work is helping others understand what went wrong.”

Another of Wyneken’s goals is to shed new light on how sea turtles migrate. Researchers know the general route taken by sea turtles born in nests along the Atlantic Ocean — swimming thousands of miles in a vast circle that spans from the Caribbean to the coast of Africa. But questions such as why individual turtles choose a particular path or how long it takes them to return to the coast of their birth “have remained unanswered because of a lack of the ability to track or mark these small, very young turtles,” says Wyneken.

This past spring, Wyneken and her assistants released five small loggerheads that had been raised in her FAU laboratory at Gumbo Limbo Nature Center, a coastal and marine preserve in Boca Raton. Attached to their backs were small, solar-powered satellite tags that Wyneken, along with collaborators Kate Mansfield of NOAA Fisheries and Dan Rittschof of Duke University, fitted to their shells and tested. The new devices, which do not interfere with the young turtles’ movement or growth, send location signals similar to a GPS system.

Watching a satellite feed on her computer, Wyneken points to a small gold star indicating the most recently recorded tag-locations of two older turtles her students named Florida Babe

(“FeeBee” for short) and Milton. The satellite lost contact with Milton just three weeks after he was released out to the ocean. “His device could have fallen off, or we could have lost him,” Wyneken says, her eyes never straying from the screen, “but FeeBee and the new gals are out there. And someday they will make their way back to Florida. It’s a process that has been going on since long before people — long before many dinosaurs.”



It has been hours of watching and waiting for a loggerhead to build her nest. Several times, turtles have peeked their heads out of the surf. Some have even emerged to inspect the dunes, but turned in distaste back to the ocean. The volunteers entertain themselves by pointing out constellations and swapping stories of past turtle sightings, but the frustration is building.

“Think we’ll get skunked like last Tuesday?” someone asks.

“Nah, we’ll get one nest for sure,” answers another.

A volunteer stationed further up the beach sends a walkie-talkie message that he’s spotted a turtle making her way to the dunes. This one is actually digging. Wyneken and the others hurry toward the site.

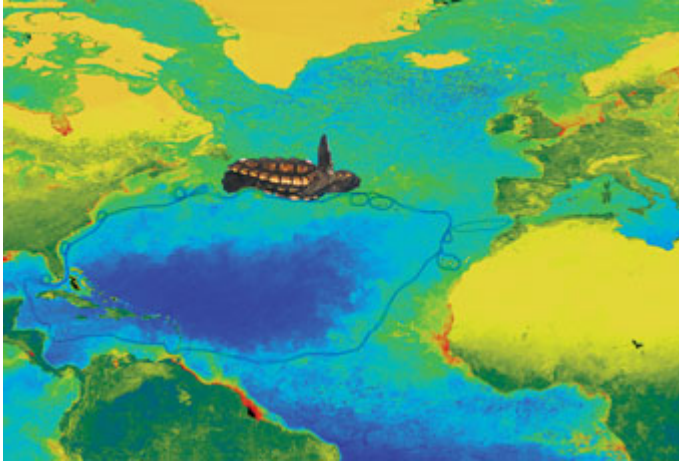
In the darkness, excitement grows. The loggerhead is facing away from the beach — a good sign. She has begun to dig a hole with her massive flippers. The group keeps its distance, waits until she is still, and then makes its way up the dune, slippery with dry sand, to get a closer look ...



A friend of Wyneken’s family first took her sailing when she was 13, and she felt instantly intoxicated by the splash of the water and the sparkling ripples of waves. “There is no freedom like it,” she says.

It is a freedom Salmon understands well. He met Wyneken during her graduate studies at the U of I, where he was teaching behavioral science at the time. They didn’t meet in the classroom — instead, the two first connected over a shared love of water and boats. “I heard he needed a member to help crew his sailboat,” Wyneken says. “That’s how two biologists meet.”

Salmon now researches turtle behavior at FAU, a path for which he credits his wife. “I was studying crabs and she was studying turtles in Florida one summer,” he recalls. “I didn’t want her to walk the beach alone at night, so I came with her. The first time I saw those baby turtles emerge from a nest and make their way to shore, I was hooked.” He doesn’t specify to whom, in that moment, he had become hooked — the girl or the turtles — but the likely answer is both.



Sea turtles living in the Atlantic Ocean generally follow currents (depicted in the map above) that take them from the coasts of North America in a circle that extends nearly to the coast of Africa. Female turtles return to the area where they were born to mate and lay their eggs. (Map courtesy of Jeanette Wyneken)

being, it's hard to imagine that someday this same creature could grow to be seven feet long.

One of her assistants at the turtle lab, graduate student Christie Gonzalez-Bergner, nudges a wobbly, white slice of something toward a baby leatherback. "It's Dr. Wyneken's homemade recipe for jellyfish," she explains. "Whoa — slow down there, buddy!" she tells the hungry turtle as it takes a large chomp.

Gonzalez-Bergner pauses a moment to reflect on her mentor. "Dr. Wyneken expects a lot from her students, but she gives you the encouragement and freedom to work and succeed or fail on your own," she says. Gonzalez-Bergner plans to continue to assist Wyneken as she prepares for veterinary school. Looking at the baby turtle, she adds, "It's unbelievable to know I am working on something that no one else in the world is doing. And working with Dr. Wyneken, who does what no one else can."

Along with her classes at FAU, Wyneken also sometimes teaches at Duke University and is an adjunct scientist at Mote Marine Laboratory. She has mentored students at the University of Amsterdam and the University of Milan. In every instance, "what I try to teach is what I learned at Illinois Wesleyan," she says. "More than facts, I want students to understand how to explore, how to be inspired by what they do, how to never stop learning."



In silent suspense, the group waits. The giant mother has finished digging a hole and readies herself for laying eggs by slowly fading into a trance-like state. Hedging their way closer, several of the group peek over the top of the dune and watch as the long-anticipated eggs, the size of large ping-pong balls, fall into the hole.

Wyneken and her husband now share space for research in the laboratory at Gumbo Limbo. An outreach program of FAU, it houses baby turtles, brought in by Wyneken and her team of students to weigh, measure and study. It is among only a few labs in the world that can accommodate infant turtles and send them back out later into the wild ocean.

In the lab, a baby leatherback turtle blinks its tiny, black eyes, and pushes its flippers in Wyneken's palm. "[The babies] won't stop moving for about three to five days," she says, describing the "frenzy" stage after infant turtles make their way to the ocean and continue to swim for days until reaching safer water. As Wyneken examines the tiny

“This is a moment that has been repeated for millions of years,” says Wyneken. Each egg carries enough nutrients to enable the baby turtles to swim for days, as well as an internal map that will bring these turtles back to the Florida and Georgia coasts to keep the cycle of life going. “Ice ages come and go. Civilizations rise and fall, but this will continue,” she adds.

After watching her lay her eggs, some members of the group make their way across the beach, heading home. They stumble across two more sets of tracks, and see another turtle exploring the dark dunes. Unconvinced the beach is right, the turtle makes her way back to the softly pounding waves. Wyneken watches her pass.

“This is about as close to a dinosaur as you will get,” she says, watching the animal’s familiar shadow submerging back into the sea, like a vision from an ancient dream.