FLORIDA STATE UNIVERSITY

Research IN•REVIEW

HIGHER PLAIN

WALK THE WOODS WITH THIS GUY AND SEE FLORIDA—IF NOT THE WORLD—FOR THE FIRST TIME

PLUS: PANHANDLE PLAINSMAN • THE WRITE ALTERNATIVE • ALL THAT JAZZ and more

InSight

IMAGERY FROM THE WORLD OF FSU RESEARCH & CREATIVITY

IMAGE: KIM RIDDLE, FSU BIOLOGICAL SCIENCE IMAGING RESOURCE

LIFE IMITATING ART seems to be the theme behind the evolution of diatoms, a class of microscopic algae found throughout the world in both freshwater and saltwater environments. So far, scientists have described more than 10,000 species of these one-celled plants, differentiating them mainly on the basis of the amazingly varied shapes of their cell walls. Diatom shells are made out of silica, the most common ingredient in glass.

This disk-shaped diatom with the oddly off-setting concaved center is a new species of the genus *Cyclotella* that was discovered recently by diatom specialist A.K. Prasad of the FSU Department of Biological Science. It's but one of several new species Prasad has found in water samples collected from Florida Bay by FSU biologists Chris Koenig and Felicia Coleman. This specimen, magnified more than 5000 times by a scanning electron microscope, is so tiny that dozens could fit on a grain of sand.

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Cover Photo: Bruce Means

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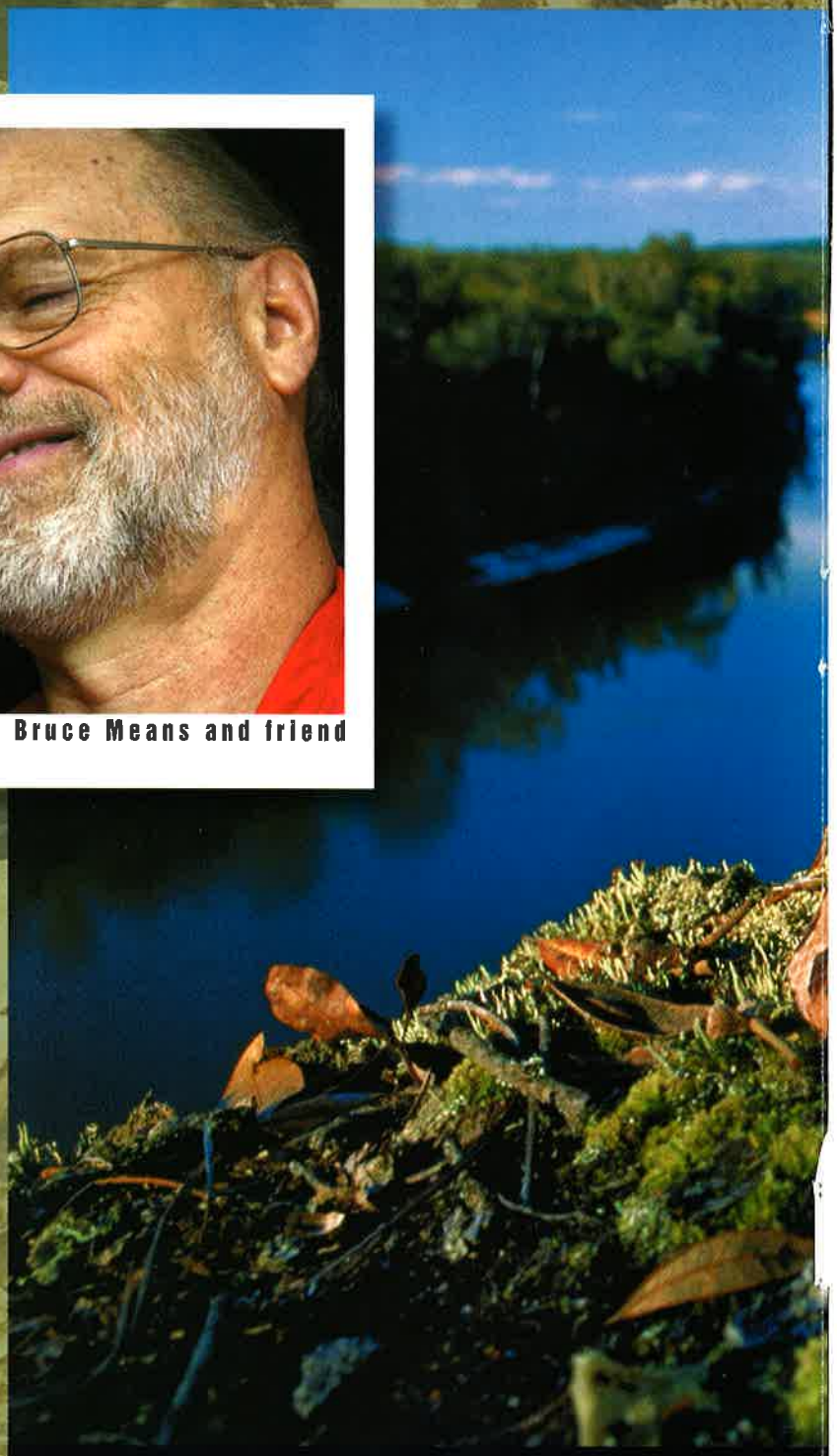
PANHANDLE

BY FRANK STEPHENSON

Bruce Means and friend



William Bartram clomped through Florida's unspoiled wilderness 200 years ago. In a happy, ponytailed snake handler in the swamps of North Florida, his spirit lives on.

PLAINSMAN

▲ **AS IF TO GUARD ITS HOME** from the unseen but ever-present threat of "people pressure," a copperhead *(Agkistrodon contortrix)* keeps a silent vigil on the edge of Alum Bluff overlooking the Apalachicola River in Liberty County. *(opposite page)* **NAMESAKE SNAKE:** Means holds a juvenile specimen of a snake he discovered in the late 1960s in the Panhandle's Apalachicola National Forest. The snake, soon to be named after its discoverer, is a subspecies of the Apalachicola kingsnake.

LIVE VENOMOUS REPTILES

So reads the handwritten sign on the small wooden box sitting atop a staircase that puts visitors squarely at his front door.

The attention-getter is intended to help ward off predators of the worst kind—the two-legged variety. More than once over the years, they've found their way into this curious inner sanctum on Tallahassee's Milton Street.

The warning on the empty box assumes that would-be intruders can read, of course, plus something more of a given. That would be humans' morbid fear of snakes.

The prankster is no psychologist. But he knows more than enough about human nature to know how to use our primal instincts about snakes to his advantage.

He should—he's been doing it for nearly 40 years.

Meet Donald Bruce Means, intrepid defender of all things creepy-crawly, champion of the slithery denizens of swamp and swale, a naturalist's naturalist with a gift for getting your attention.

On a drizzly North Florida summer morning, he's home and itching to tell a visitor about his latest adventure. At six-foot-four, this bearded biologist with a long gray ponytail doesn't need to get this excited to electrify his small office. In the vernacular, it just comes natural.

Means is back from another trek into the wild highlands of northern Guyana. It's his 13th trip to South America since 1987, when he first scratched an itch to visit one of the world's most stunning sights—a series of flat-topped, sandstone mountains that from the boggy floors of rainforests suddenly vault into the air like startled giants.

Means has just returned from "tepui land." The word "tepui" (teh-POO-ee) is a local term that describes something of the same thing that dot the deserts of the western U.S., he explained. Out there, they call them "mesas."

What had triggered this latest foray into tepui country for Means was an invitation by the producers of a National Geographic TV program to join a scientific expedition to the summit of Mt. Roraima (roar-RIME-ah), at 9,220 feet one of the most formidable tepuis of them all. Since working with National Geo on other films—mainly on rattlesnakes, one of his specialties—Means had been urging the company to consider doing a feature on Roraima, which he'd already climbed three times.

The company had finally given a thumbs-up to the project. Filming had gone well, and despite the physical toll that hacking an eight-mile trail through virgin jungle took on the crew, after the month's ordeal everybody involved wound up happy. Means especially.

"Gosh, it was wonderful, just wonderful," he exclaimed, off now on a lively, hour-long account of the trip and what he'd found.

"Just look at these! No one's ever seen these before! It's amazing what's down there!"

Means held up a plastic sheet of 35mm slides. They were photographs he'd taken of some exotically colored tree frogs that he'd collected along the steamy trail to Roraima.

"These animals are all new to science," he said. "I've gotta get 'em analyzed, but I'll bet anybody I'm right."

By all accounts, it's likely not a bet he'd lose. A close colleague of Means'—FSU marine ecologist Joe Travis—puts Means' ability to spot new animals in the "uncanny" category.

"I've never seen it fail," Travis told Research in Review recently. "Bruce can pick up a frog or a toad or a salamander or an earthworm or a snake and almost instantly know what it is and whether it's a new find. His intuition with these animals is incredible."

Travis put his finger on but one of the key traits that distinguishes Means' long and productive career—and sets him clearly apart from the rank-and-file field biologist.

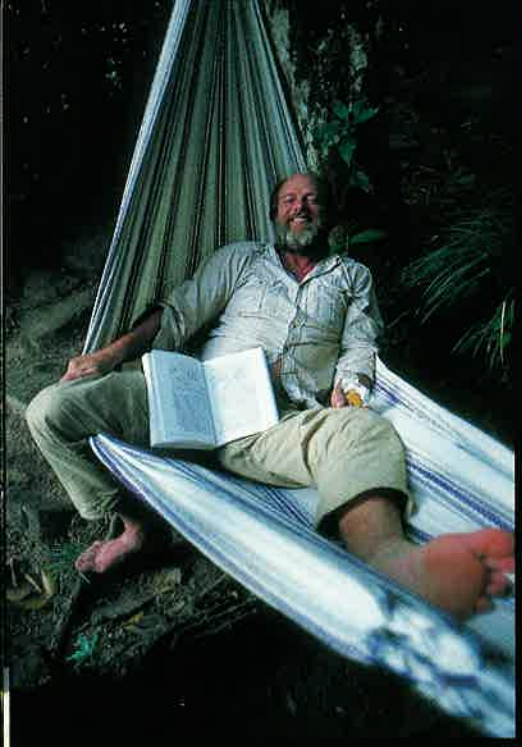
Today, at 63, Bruce Means—adjunct pro-

PHOTOS: BRUCE MEANS

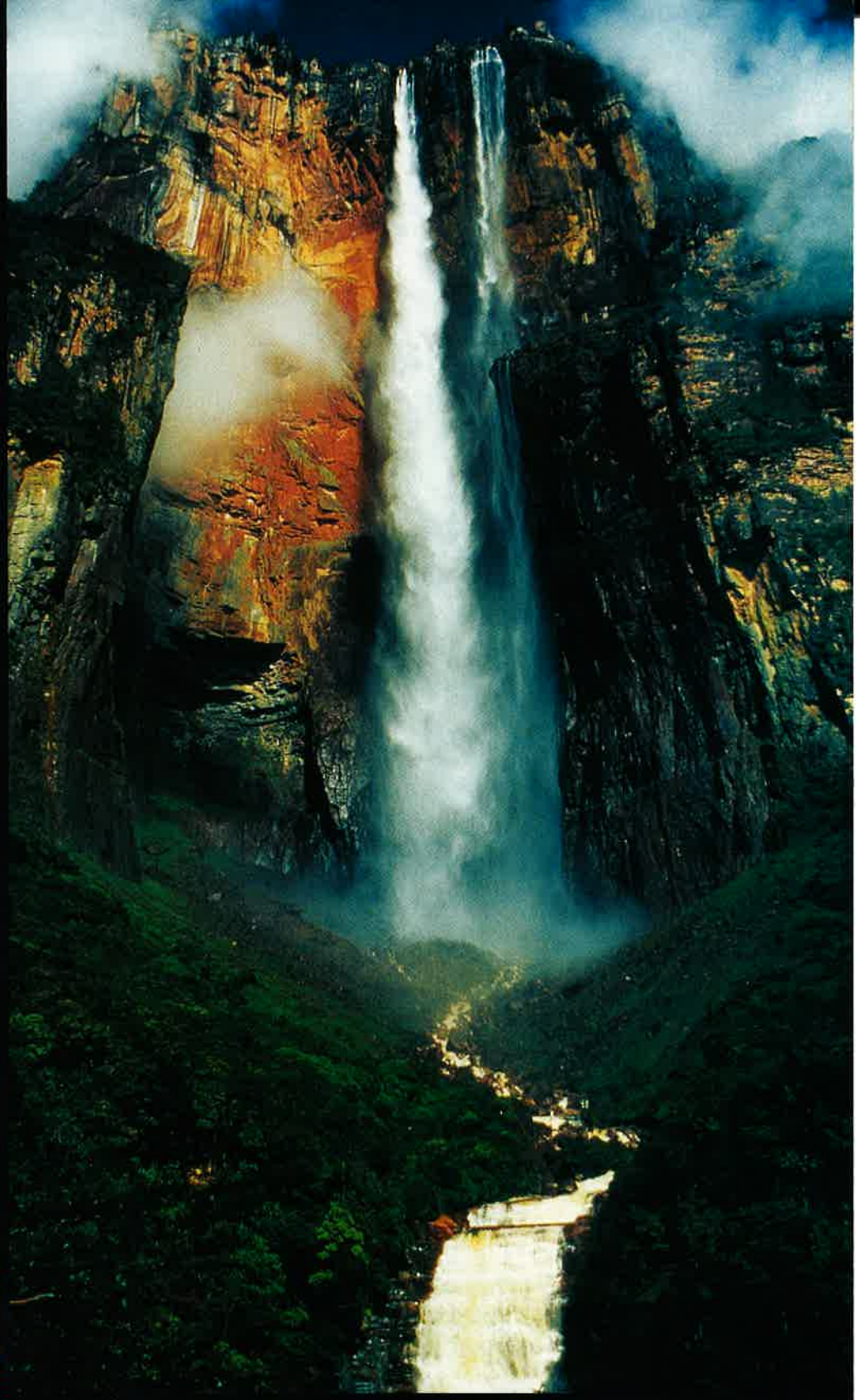
SINCE HE FIRST SET FOOT on the tepui trail in 1987, Means, seen here on en route to Angel Falls in 1992, has kept a daily journal of his adventures in the Guyana highlands. Means says his explorations in South America and elsewhere help to rejuvenate his work in North Florida.

A COLORFUL CREEK BED made up of the semiprecious gemstone jasper gives this stream in Venezuela's La Gran Sabana region an exotic character.

Means is back from another trek into the wild highlands



WHEN THREATENED, this black pebble toad, *Oreophrynella niger,* curls up and rolls downhill. Means collected this specimen from atop Cerro Kukenan tepui.



▲ **THE TALLEST WATERFALL** on Earth is Angel Falls, where water plummets 2,471 feet from the top of Auyantepui in Venezuela. The falls is named after a barnstorming American pilot Jimmy Angel who, in 1933, became the first westerner to describe it.

of northern Guyana...his 13th trip to South America since 1987.

GENES WILL OUT

Early signs that Means might pursue a career as a snake ecologist date at least to his seventh year, when proudly he held up his first snake, a California kingsnake, in 1948. *(above)* A 10-year-old Means hoists a fine catch of silver salmon that he and sister Claudia helped catch on a family fishing trip up the Kenai River in Alaska in 1951.

IN HIS EARLY 20S, Means took a break from his studies at FSU to return to his roots in Alaska and work as a survey technician for the state's Bureau of Land Management.

PHOTOS: BRUCE MEANS

Bruce Means the serious scientist is impossible to discuss apart from Bruce Means the man.

fessor of biological science at FSU—sits happily atop a respected niche that he carved pretty much single-handedly into a wall of science that few have scaled with such gusto. His admirers—those quick with a comment are easy to find—seem to agree on a central point—Bruce Means the serious scientist is impossible to discuss apart from Bruce Means the man.

As is so often the case with popular writers whose fictional characters often mirror their own personalities, Means' larger-than-life persona tightly defines how and what he does as a scientist.

His critics—he's too big a target not to have some—typically shoot from behind tenured desks (Means has never been near the tenure trail), suspicious about his methods (Means holds that accuracy trumps orthodoxy) and his motives. Means' history of writing for popular audiences, and in particular, his willingness to "star" in several nationally televised nature programs over the years rubs the tender parts of those whose tastes in science run to the staid.

Even his detractors will readily admit that of all the things Means' may be, staid is not among them.

Here's a guy who commands an almost encyclopedic knowledge of the biology and ecology of an entire region of the country—the Southeast's coastal plains region—who is every bit as agile of foot as he is of mind.

Even today, walk into the woods with the man on a mission, and he'll punish you with his drive to get the job done. Ask him to serve on your degree committee, and be prepared to hear questions that confound and amaze everybody in the room. Don't do a damn thing, and Means will still manage to make you smile.

ON THE ANGST HIGHWAY

Such is the essence of this self-made, self-driven biologist who, at age 25, finally discovered his true calling in life.

Even before his epiphany, which occurred, fittingly enough, in a mile-high cloud forest in Panama, Means had been living a large—if unfocused—life.

The only son of a jack-of-all-tradesman from south Florida, Means is in truth a native Californian. He was born in downtown Los Angeles, in fact, on a parcel that had been in his mother's family for three generations. While his dad served a wartime stint in the merchant marine, Means was raised "in a house full of women," as he puts it. He still carries painful memories of an early childhood spent penned into a tiny play space between his mom's house and a garage, walled off from the world by a chicken-wire fence.

He loathed the place. Spiders—real or imagined—lurked beneath the house and came to be an unshakeable source of nightmares that would dog him for decades. Psychologically, Means could make the case that he's been fighting his way out of that frightful corner of his childhood all his life.

Eventually, after his dad returned, the family migrated to, of all places, Alaska. His dad had fallen in love with the country, first as a bulldozer operator and later, surprisingly enough, as a part-time Hollywood actor. It had been more than enough northern exposure for Means' dad to chuck everything—including an unlikely shot at fame on the silver screen—load up the truck and head up the yet unfinished Alaska-Canada Highway toward Anchorage.

By 1954, Means' family had settled on a beautiful tract of hillside in the Chugach Mountains southeast of Anchorage. In Means' words, what followed was "the greatest growing-up adventure a young teenage boy could dream of."

When he wasn't helping his dad build the family dream house (a project that took five years of back-breaking labor to complete) Means avidly explored the great Alaskan outdoors. He fished for Dolly Varden in icy mountain streams, hunted caribou, snowshoe rabbit and grouse, and came face-to-face with black and grizzly bears.

His first encounter with a grizzly came close to being his last as well. On a summer camping trip with the family up a river gorge, a huge female grizzly suddenly appeared out of a nearby treeline and charged down on Means' and his terrified family. Before his dad could chamber another round in his .357 rifle (the first had jammed) the bear was in full gallop. Just 30 feet from the Means' wagon, the shot spun around the huge beast, who then high-tailed it back into the woods.

In high school, Means' size (at 16, he stood six-four and weighed 185 lbs) helped him quickly become a stand-out in sports. By the time he graduated in 1959, he had lettered in basketball, football and track and field. But sports couldn't hold his interest, which was reserved entirely for a sweetheart he could scarcely wait to marry.

At 18, Means found himself happily married but suddenly faced with some grown-up decisions. Broke, unemployed and out of college (he'd tried a quarter at the University of Montana), he left Alaska with his young wife for a warmer clime and a fresh start. The couple wound up in Ft. Lauderdale, Florida, where Means found work as a tanker-truck driver for an oil company. Within a year, he'd established residency in the Sunshine State, saved some money, and was headed back to college. This time to Florida State University.

What started out as a dogged pursuit of a bankable college degree—one that would be his ticket to an easy life—soon

bogged down into a morass of frustration for Means. Within his first three years, he'd switched majors twice, from math to physics. Most of what he encountered in his coursework bored him. Everything, including his marriage, was beginning to look like a dead end.

But not everything was bleak. Means soon fell in with some classmates who took their birthrights as Florida good ole boys seriously. On weekends, Means got tutored in the basics of bass fishing, sinkhole diving, frog gigging—and his biggest thrill of all, snake hunting. In the lakes, swamps and woodlands around Tallahassee, he rediscovered his childhood passion for wild animals, nature and the great outdoors.

A DOUBLE HANDFUL OF BABY southern leopard frogs, ***Rana sphenocephala,*** signify part of Means' nine-year assessment of the changes in amphibian and reptile populations generated by or attracted to a small forest pond south of Tallahassee. So far, the biologist has found sharp drops in the populations of two species of newts, two species of salamanders and one type of frog.

ARACHNOPHOBIA CONQUERED: With the world's largest spider sitting on his hand, Means shows proof that a morbid fear of arachnids that marked his childhood is largely overcome. The hairy critter, found last year at the base of Mr. Roraima in Guayana, is the bird-eating goliath tarantula, ***Theraphrosa blondi.***

PHOTOS: BRUCE MEANS

PHOTOS: BRUCE MEANS

Bruce Means is the first scientist to describe the biological importance of one of the Panhandle's most remarkable geographical features.

As a graduate student hell-bent on finding salamanders for his studies at FSU, Means explored a series of steep ravines above the river town of Bristol in Liberty County. These small canyons cut into the sandy topsoil beneath the piney woods flanking the Apalachicola River.

These ravines, which drop to 100 feet deep in places—and at 45-degree angles—were dubbed "steepheads" by

STEEPHEADS: FLORIDA'S TIME MACHINES

early settlers. Unlike common gullies, cut by temporary flooding, steepheads are permanent features with spring-fed creeks that never dry up, even in drought conditions, and that flow into the nearby Apalachicola. Over time, steepheads migrate headward and laterally in serpentine patterns that can stretch for miles as the springs beneath them slowly cut down their sandy banks.

Steepheads had been known to geologists for decades, but not to biologists. Thankfully, their remoteness, coupled with their formidable topography, has kept these ravines free of most manmade encroachments such as agriculture and urban development. The result, Means found, is a largely undisturbed ecosystem that represents a natural refuge that has protected certain plants and animals for thousands of years.

Many of the species found in steepheads no longer exist anywhere else.

"...I just laid down, looked up at the overarching forest canopy

▼ **A GROUP OF EMPLOYEES from Florida's Department of Parks and Recreation gets acquainted with a steephead on a trip led by Means. This site is within Florida's Torreya State Park in Liberty County.**

▲ **FROM THE AIR, steephead valleys throughout the Apalachicola River basin present nature's own hieroglyphs, a verdant imprint of a unique marriage of geology and ecology.**

Means says the ravines hold the largest populations of a number of salamander species—including the Apalachicola dusky—that still exist. These cool depressions also are the primary habitat for many rare and sensitive plants, including the Florida yew, the Panhandle lily, the Ashe magnolia, the silky camellia, the croomia and the Orange azalea. **—F.S.**

Means sensed that he'd probably be happier as a biology major, but where was the future in that? It was common knowledge that biologists made no money. Why bother going to college if that's not your life's ambition?

Still, Means' pals talked him into signing up with them for a course in vertebrate biology. As his friends figured, he ate it up. Means liked the course so much, in fact, that when it was over he stopped by the office of the man who taught it, Henry Stevenson. It was a talk that would change his life forever.

To treat his student's angst, Stevenson suggested that Means give some thought to finding out first-hand what professional biologists in the field really do. He mentioned he had a former grad student who banded migrating birds in Panama and he happened to know that he could use some muscle. The job didn't pay much (who knew?) but at least it would get Means into a professional setting for three months—and in a tropical country, no less.

Means couldn't believe his luck. He soon found himself speeding toward his first big adventure abroad. In the highlands of central Panama, he trapped and banded toucans, parrots and other exotic birds, caught snakes, frogs and salamanders, and climbed solo to 12,000-foot vistas overlooking cloudy, rain-forested valleys.

Means recalls his life-changing moment with reverence.

"One morning as I was opening up these big mist nets (used for capturing birds), I watched a huge column of army ants come marching across the forest floor, and all these frogs and lizards scrambling to get out of their way, and I was absolutely fascinated by the whole spectacle," he said. "When it was over, I just laid down, looked up at the overarching forest canopy and realized that this was the life for me."

With crystal clarity, Means suddenly realized that his dreams for becoming a success weren't his dreams at all. He'd

PHOTO: BRUCE MEANS

▶ **NO MODERN SCULPTURE this, a giant relic of erosive forces that have carved the landscape atop Cerro Kukenan tepui for tens of millions of years.**

and realized that this was the life for me."

been living his parent's value system, which defined "success" only one way—making money. A massive weight slid from his shoulders.

"Until that very moment, I had never questioned my parents' value system at all, not for a second," he said. "I suddenly realized that 'success' is being happy in what you want to do in life, and I knew that, godalmighty, above anything else *this* was what made me happy!"

Since that day in 1966, Means says he's been trying to make up for what he calls his "lost years" of chasing a phantom of a career in something he hated.

"I've never looked back, and I've had a ball."

TALL STEP

Returned to campus with a new plan, Means switched majors again. He got a bachelor's degree in biology, then headed for a master's, focusing his studies on an aquatic animal that had held his fascination since he was a child—salamanders.

Means surprised people—even himself at times—with his adeptness at finding these shy amphibians that inhabited most of the wet places throughout North Florida and southern Georgia. He became a regular maven of the muck, a hard-core hunter-gatherer in the abundant fields of bog that surrounded Tallahassee.

Needing a special instrument to properly measure his squirmy finds—and finding none at FSU—Means learned that scientists working at a place called Tall Timbers Research Station a few miles north of town might be willing to loan him their set of dial calipers. They did, and more. Impressed with Means' gung-ho spirit, the station's managers took a shine to Means and soon offered him a part-time job.

By the time he finished his master's degree, Means was working full time at Tall Timbers as assistant director. He soon had moved his family (he had become a dad in '68) into quarters on the plantation, and suddenly Means was on a fast track to becoming a career biologist.

He would spend the next 15 years at the nonprofit research station, earning a Ph.D. and eventually becoming the station's managing director. He developed a reputation as an authority on fire ecology—the science of using controlled burning to maximize the biological potential of woodlands—and on an scaly critter of the Southland that strikes paralyzing fear in many a mortal.

SNAKES ALIVE!

In 1975, Means finished up a doctorate at Florida State, defending a dissertation on the dusky salamanders, a class of amphibians once found in scattered locales throughout the Southeast. By that time, though, he'd found another animal that had captured his attention—the eastern diamondback rattlesnake, the largest—and deadliest—snake in the Northern hemisphere.

Early on, Means had learned that the diamondback lived in relative abundance throughout the entire 4,000-acre Tall Timbers tract. It disturbed him that the management of the research station condoned the routine killing of the animal whenever and wherever it was encountered on the property.

When Means discovered that no in-depth study of the diamondback had ever been done, he saw an opportunity. He realized that every working day, he was standing in a veritable rattlesnake research laboratory, where development had yet to destroy one of the animal's last, large habitats.

"I realized I was perfectly situated to undertake a long-term study of the snake, the first of its kind on the species," he said.

So began his love affair with the life history and ecology of the eastern diamondback rattler, a passion he's pursued now for 28 years. By the time he left Tall Timbers in 1984, Means was widely recognized as the nation's leading expert on the diamondback. He's conducted the most exhaustive studies on the animal ever done, and contributed more to the scientific literature on diamondbacks than anybody.

For eight years at Tall Timbers, Means pioneered techniques to track and study this surprisingly shy, non-aggressive reptile that can grow to seven feet in length. By implanting radio beacons inside large adults, Means discovered fascinating clues about rattlesnake behavior.

For example, he was the first scientist to prove that—contrary to conventional wisdom—the diamondback is not nocturnal, as are most other rattlesnakes. In fact, Means found that diamondbacks only rarely venture out of their hiding places at night, preferring to hunt for food in daylight.

His radio telemetry work also revealed a startling detail about diamondback personality. For all their fearsome reputation, the snakes are extremely shy around humans and will suffer surprising indignities in the wild—such as being deliberately stepped on—without raising a fang in protest.

In hundreds of encounters with the animal in the field, Means never witnessed any aggression toward a human intruder from what he calls "the Gentle Ben" of snakes. Albeit wearing snake-proof boots, he has purposely stepped on coiled rattlers he's

▼ **RATTLE TATTLE:** Field assistant Jim Eggert paints a rattler's rattle to gauge how often the snake sheds its skin before recapture. *(below)* **THE FULL MEASURE** of a snake biologist's work can be tricky. Here, Means takes the length of an eastern diamondback on Little Saint Simons Island, Georgia, where he conducted a large rattler research effort in the 1990s.

▼ **A FAMILIAR FACE** to anyone who's ever spent time in the South's fields and streams is that of the cottonmouth water moccasin, ***Agkistrodon piscivorus.*** Means keeps this fine specimen in his Tallahassee office.

PHOTOS: STEVE DECRESIE

PHOTO: RAY STANYARD

▲ **FRIENDLY FIRE:** Means poses with grandson Chandler Means during a controlled burning of longleaf acreage last July.

found hiding under clumps of grass and been amazed at how the secretive reptiles kept their cool. "They didn't even rattle, much less try to bite," he said.

He hasn't always been so lucky. Twice in his career, Means has come close to dying from diamondback fangs. Just one of these painful, highly traumatic experiences would be enough to quell the ardor for rattler research in the average biologist. Means chalks up his near-death brushes with rattlers as "stupid mistakes" that don't deter in the least his admiration for the nation's most potent pit viper.

Over the years, Means' reputation as a rattlesnake expert has put him in the national spotlight. He's been featured in two made-for-TV documentaries on snakes produced by National Geographic, as well as three episodes of National Geo's *Snake Wrangler*, shot for cable TV.

LONGLEAF CHAMPION

Means has used his exposure as a rattler scientist to promote conservation measures to protect what's left of diamondback habitat.

Once common from Virginia to east Texas, where towering stands of longleaf pines blanketed the coastal plains, the snake can no longer be found in some states (e.g. Louisiana) and is an endangered or threatened species everywhere else.

During his Tall Timbers years, Means became immersed in the historical and ecological importance of longleaf forests. He came to appreciate his new "lab rat"—the eastern diamondback—as being a poignant reminder of what is still one of the biologically richest places on Earth despite suffering a hammer blow from development during the past century.

Somehow, the diamondback is just one of many threatened species that have managed to survive what Means and other ecologists mourn as the tragic loss of the Southeast's longleaf forests. Over the millennia, this vast woody heritage spawned untold numbers of species of plants and animals that depended entirely or in part on the health of the longleaf.

Scientists have estimated that when Hernando de Soto first dropped anchor off a Gulf beach in 1539, more than 60 percent of the Southeast's coastal plains region—stretching 2,000 miles from Virginia to eastern Texas—was covered by millions of longleaf pines. This translates into roughly 82 million acres of woodlands dominated by a single tree species known to have a life span of five centuries.

Today, so little remains of that old-growth forest that it almost could fit in a tree museum—less than 2,700 acres by the latest count. The bulk of what's left of longleaf in the world is almost all second-

PHOTOS: STEVE DECRESIE

▼ **FIELD ECOLOGY 101: Means leads a field trip into the Apalachicola National Forest in October 2002.**

▲ **SOME OF THE WORLD'S LARGEST concentrations of the trumpet pitcher plant, *Sarracenia flava*, occur in the Apalachicola National Forest.**

ary growth, trees arising from natural regeneration or replanting since around 1930. And there's only about 1.6 million acres of that, mostly protected inside military bases and national forests.

Means wholeheartedly agrees with the stark assessment of two botanists, B.W. Wells and I.V. Shunk who, in the early 1930s, witnessed the demise of the last remaining large stands of old-growth longleaf pines. In their "epitaph," the scientists wrote: "The complete destruction of this forest constitutes one of the major social crimes of American history."

Since almost every animal he's chased for the past four decades owes its existence, at least in part, to the fading remnants of that longleaf ecosystem, Means feels the pain of its passing more keenly than most.

"By and large, people don't fully appreciate what we've lost and what it means," he said. "They fly over our region and see all the green and say 'wow' look at that! They're lulled into believing everything is OK because the place is full of pine trees."

But what has replaced the forests of yesteryear—neatly planted rows of loblolly and slash pines for the most part—is a weak substitute, ecologically speaking, for the old longleaf savannahs, says Means.

"It would be the same if we had eucalyptus trees or some other exotic (pines) out there, because those pine species are just as alien. Their ecosystems don't begin to compare with longleaf ecosystems."

FLORIDA'S PANHANDLE, **still the state's least populated region, holds one of the richest diversities of plants and animals in the Northern hemisphere. Means' Coastal Plains Institute studies the ecologies of steepheads (see page 22), and the Apalachicola River basin, home to hundreds of species including the now-threatened Apalachicola kingsnake.**

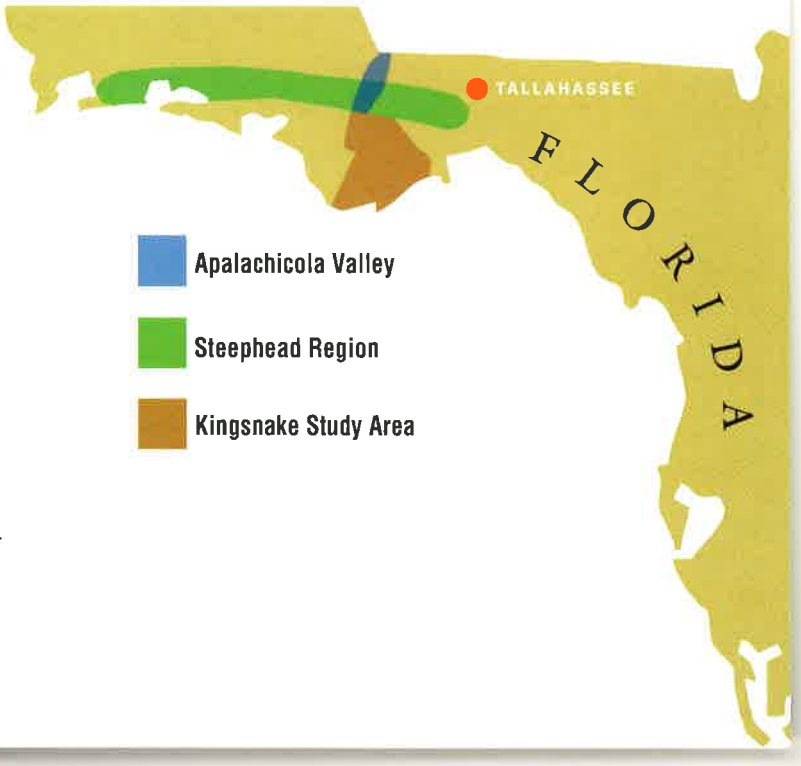


PHOTO: BRUCE MEANS

▲ **STILL COMMON, but becoming far less so as development continues to take its toll, is the eastern kingsnake, *Lampropeltis getula getula*, found throughout the Florida Panhandle and adjacent Georgia and Alabama. *(upper right)* THIS RARE BEAUTY is in fact a subspecies of the Apalachicola kingsnake, which, like most kingsnakes, is banded. Means discovered this "pure" phase of the species in 1965.**

In 1996 Means completed an inventory of all the old-growth longleaf left in the country, the first thorough assessment of the trees done in decades. It was a sobering study, revealing that only about 5,000 acres remained standing from Texas to Virginia. Within three years of his own study, another inventory conducted by botanists at the University of Florida showed this acreage had been cut almost in half.

Means is hardly naïve. He knows the world will never again witness the natural wonder of an unfettered longleaf forest on anything approaching a grand scale. Yet he clings fervently to the notion that nurturing what's left is a biological imperative—and a humanistic one, too.

As a consequence, Means has become something of a longleaf evangelist. His efforts have won him high praise from some esteemed sources, among them Florida State's own Fran James.

Newly retired from the university's biological science faculty, James is considered one of the nation's leading authorities on longleaf forests and their historic association with the endangered red-cockaded woodpecker (see "Second Chance," a feature on James' work, at www.research.fsu.edu/researchr/winter2003/secondchance.html). She's admired Means' work for years.

"Bruce is the most forceful advocate for restoration of longleaf ecosystems we've got in North Florida," she said. "He's a dedicated champion for good management."

PHOTOS: BRUCE MEANS

▲

NOW EXTINCT? No better example of the decline in the diversity of animal and plant life in the Panhandle is the southern dusky salamander, *Desmognathus auriculatus*. Pictured are the female of the species (top) and the male. Once abundant in cool-water ravines and other low places throughout North Florida, not a single specimen has been found by biologists—including Means whose doctoral work at FSU in the 1970s focused on the animal—in nearly a decade.

▶

ANOTHER NORTHERN VISITOR THAT STAYED in Florida is the mountain laurel (A), which escaped the southern Appalachian Mountains during cooler, glacial times to take up residence in the Florida Panhandle. THIS FIRE-BACKED CRAYFISH, (B) *Cambarus pyronotus*, is found only in the steephead ravines along the eastern side of the Apalachicola River. THE ORANGE-FLOWERED FLORIDA AZALEA, (C) *Rhododendrum austrinum*, is among the native plants still clinging to survival in discrete places along the Apalachicola River's shorelines.

PHOTO: RAY STANYARD

A FLORIDA BOOK OF KNOWLEDGE

Imagine what Florida would look like if state law required all residents to pass a test on their knowledge of the state's natural wonders before they could get a driver's license.

The idea, of course, would be to connect the concept of good citizenship with that of good stewardship. By implication, if you think the Everglades is a hot new rock band, you don't deserve to live here.

Such a law would instantly solve one of the state's biggest headaches—highway congestion. With no legal way to drive, Floridians likely would stew in their natural ignorance before they took up bicycles or mass transit.

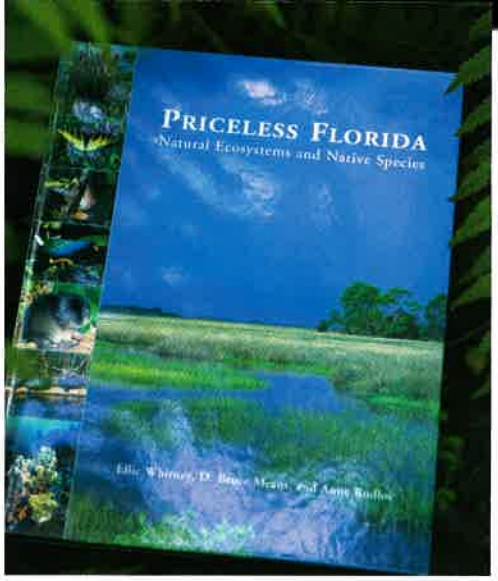
Sober assessments of the average Floridian's nature I.Q. put it somewhere between abominable and criminal. For years, popular writers such as Carl Hiaasen have gotten rich by hilariously mining a mountain of environmental ignorance in a populace that would be hard put to differentiate between a sandhill crane and a sandbar.

Now comes a delightful new way for all Floridians to see and understand their marvelous state as never before. A team of environmental writers based in Tallahassee has produced a rare species of guidebook specifically designed for those who are embarrassed to admit how little they know about what's left of the wild side of the Sunshine State.

Priceless Florida: Natural Ecosystems and Native Species (Pineapple Press) is an all-new, comprehensive, layman's guide to the state's natural treasures. Written expressly for a general audience, the 432-page book takes readers from the coral reefs of the Keys all the way to the highest piney ridge in the Panhandle, highlighting the trail with more than 800 color photos.

The book is the brainchild of Ellie Whitney, a Ph.D. molecular biologist and author of some two dozen textbooks. Whitney was inspired to launch the project 16 years ago after she got her feet wet (literally) in courses on Florida ecology taught by Anne Rudloe and Bruce Means, two of North Florida's most well-known naturalists. Means and Rudloe are co-authors with Whitney on the book.

A Manhattan native, Whitney moved to Tallahassee in the early 1970s and soon became hungry to learn about the natural history of her adopted state. She got way more than she bargained for when she signed up for Rudloe's and Means' classes.



▲ ***Priceless Florida*, released by Pineapple Press in October, is a primer on Florida's ecology.**

PHOTO: RAY STANYARD

While Rudloe introduced her to the Panhandle's luxuriant saltwater marshes, Means guided her through freshwater swamps, upland streams and pine forests. Whitney took all of their courses, some of them twice, relishing the scientists' energy, flare for teaching, and above all, their passion for their subjects.

"Nothing turns Bruce on more than finding something under a rock," Whitney quipped. "And he has a real gift for getting others excited about it, too."

Priceless contains some of the latest scientific and environmental findings on Florida available, and is replete with handy glossaries of scientific terms found in the margins of almost every page.

Advance copies of the book won praise from some high-profile reviewers. Among them, Harvard's famed sociobiologist E.O. Wilson who wrote that the book "combines the depth of an encyclopedia with the freshness and accessibility of a field manual."

To help make the book as useful as possible, the authors pushed to make the heavily illustrated book's selling price palatable to the average pocketbook, said Whitney. With a grant to subsidize printing costs provided by the Elizabeth Ordway Dunn Foundation, a nonprofit group based in Coral Gables, the book debuted with an attractive $29.95 hardcover price.

For information on obtaining a copy of *Priceless Florida*, visit the Pineapple Press Web site at www.pineapplepress.com or call 1-800-746-3275. – **F.S.**

PHOTOS: BRUCE MEANS

HOME ON THE PLAINS

In 1984, Means left his post at Tall Timbers and, in a fashion that surprised no one who knew him, lit out on a new trail all his own. He established a nonprofit research center, and named it after a place he'd grown to love.

This year marks the 20th anniversary of the Coastal Plains Institute (CPI), a vehicle Means has used to call attention to the extraordinary ecology of the coastal plains region and to push for measures to protect what's left of it.

Means serves as president and executive director of the institute and answers to a five-member board of trustees. Supported entirely by grants and private donations, CPI is headquartered on Milton Street, five minutes from Florida's capitol.

Means likes the proximity to state and local government (for years he's served as a non-paid advisor on various local science and environmental committees) and to his alma mater, where he maintains close ties with his colleagues in biological science. Until last year, when a funding cutback killed it, he had taught three highly popular courses on coastal plains ecology for FSU's community education outreach center for 22 consecutive years.

For what is essentially a one-scientist operation with adequate (but decidedly modest) operating capital, CPI has much to show for its two decades.

"From Day One, our mission has been to raise public awareness about the biological and ecological distinctiveness of this wonderful region we have in the Southeast," says Means. "There's truly nothing like it anywhere else. The idea is that if we help make people aware of how special a place this is, they'll want to save it."

Although the Southeast's coastal plains stretch from Virginia to eastern Mexico, by far the biologically richest area within this entire region is right out Tallahassee's front door, Means said. Inside a two-hour drive west of town, in the state's Panhandle region beats the heart of an ecosystem unlike anything found in the U.S. or Canada.

"The Panhandle is still incredible, even with all the development coming in," says Means. "We've got the largest number of snake species—45—in the country and Canada; the largest number of frogs—27; the largest number of turtle species—25; and one of the highest diversities of salamanders—about 28 species—in North America."

Aside from reptiles and amphibians, the region is home to more than 50 species of mammals, ranging from black bears to wild hogs; nearly 100 species of birds—including the endangered red-cockaded woodpecker—and 85 species of freshwater fish. Some of the latter, such as the sturgeon, bowfin, and the alligator gar, are considered living relics—fossil records show that these large fish swam the area's first streams and rivers as they were forming 70 million years ago.

Complementing the Panhandle's animal life is a bewildering variety of plants, says Means. To date, more than 2,500 species of flowering plants, grasses, herbs, shrubs and trees, many of them found nowhere else on the planet, have been identified throughout the region.

Most of this species richness is concentrated in the Apalachicola River basin, which drains a meandering, 120-mile stretch from the Alabama-Georgia border to the Gulf of Mexico. Means has made the unique treasures found in this ancient river basin much of the focus of CPI research (see "Steephead Science" page 22).

FIRE FIGHTER

Of all the things Means' is proudest of, he says it's his institute's accomplishments in environmental education.

On top of the courses he's taught over the years and his popular and scientific articles (collectively, more than 240 to date), Means has been highly successful at using film and television to spread the conservation word.

Since 1986, CPI research has been featured in 50 TV programs, including seven documentaries filmed by major producers. Means' research has been seen in two hour-long *Explorer* episodes produced by National Geographic and in a six-part nature series produced by the BBC. He's also been featured on Florida and Georgia PBS stations.

In 1993, CPI bought an 80-acre parcel of land within the Apalachicola National Forest in Liberty County. The move was essentially a chance to practice what the institute preaches about managing forests for the maximum benefit of plants and animals.

STEALTH AND PATIENCE are all this tree-climbing toadlet, a species new to science, needs in its nightly vigil on small leaves. Capable of grasping with both its hands and feet, the frog thrives on ants and other tiny insects. Means discovered this species in the cloud forests of Wokomung Massif tepui last year.

Means began restoring the tract—degraded from overharvest and poor management practices—to native longleaf pine habitat, using what he'd learned at Tall Timbers about fire's essential role in that. He's turned the property into an outdoor classroom of sorts, where students can get their hands grimy in a genuine controlled burn experiment.

"It's an unusual place where people can actually come see for themselves how fire works its wonders to build healthy and rich upland ecosystems," he said.

In 1996, CPI's success with its small holding in Liberty County prompted state lands officials to deed over to the institute 170 acres of wetlands bordering Perdido Key near Pensacola. The property, a mixture of salt marsh, freshwater swamp and upland slash pine forests, contains one of the largest profusions of pitcher plants—a carnivorous species that only grows in bogs—found in the world.

While at Tall Timbers, Means became the first ecologist to show the watery pitcher plants' surprising dependency on fire. He's managing the Escambia tract accordingly, using it as an even larger model for teaching forestry management based on sound ecological practices, built largely around the sustained and wise use of burning.

CRITTER-GITTER PRO

As incredible as it may seem, there are biologists in the field who rarely set foot in one of the unair-conditioned variety, preferring to spend most of their time massaging data or designing experiments in the comfort of a lab.

If field ecology were a war instead of a science, Bruce Means would surely rank among the assault troops.

"Bruce is the best I've ever seen in the field, period," said Kenneth Krysko, a herpetologist with the Florida Museum of Natural History in Gainesville. "He's just got a natural talent for finding things out there. You really can't appreciate it unless you've seen it."

...in his career Means may have discovered a dozen species of animals new to science.

Krysko may be somewhat biased—he earned a Ph.D. at the University of Florida partly under Means' tutelage. But his sentiment rings true with others who've watched the man work the woods.

Larry Abele—former head of FSU's Department of Biological Science, now the university's provost—recalled a 1976 trip with Means to Jamaica in search of some rare, landlocked species of crabs.

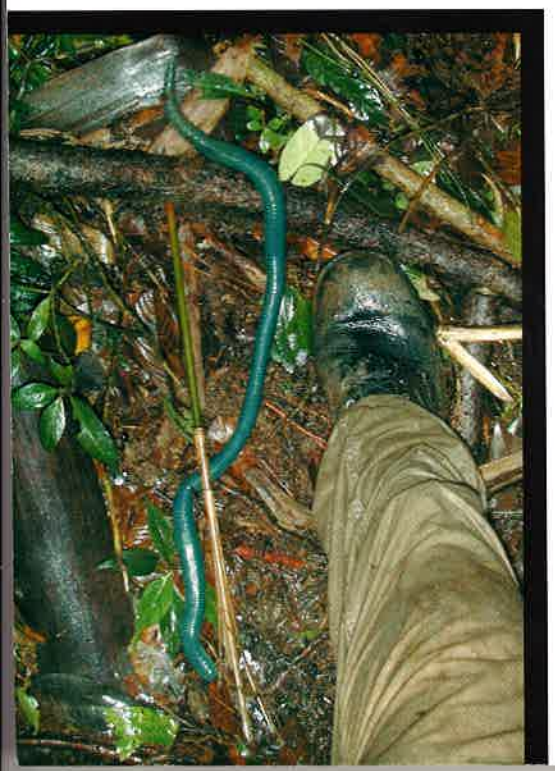
Dubious—he knew Means had only a scant knowledge of the country's interior—Abele had little choice but to follow his lanky guide—armed only with a local map and a compass—cross-country, zigzagging through head-high grass, patches of jungle, and up and down steep slopes for miles. Hours later, a tired, sweaty Abele stood beside a small pristine pool ringed by shrubby plants that held a dozen specimens of the prized crustacean.

"He's just phenomenal in the field," Abele said, who's since followed Means on other field trips both here and abroad. "If you want something done out there, Bruce will get it done. He's the real deal."

In biology, it's not all that uncommon to find researchers who have an extraordinary knack for tracking down hard-to-find animals, plants—even genes. Such scientists are said to have "a feel for the organism."

By his count, in his career Means may have discovered a dozen species of animals new to science. These include three species of salamanders, two blind crayfishes (found while diving North Florida's many dark-water sinkholes), possibly as many as six frogs, a snake, and a strange, Arkansas earthworm whose bodily fluids glow bright green in the dark.

He found the worm while searching for salamanders in



WORMS AS BIG AS SNAKES inhabit Guyana's tepui land, Means discovered in August 2003. Means found this giant earthworm on the forest floor leading up to Mt. Wokomung. This specimen topped three feet in length and was an inch thick. New to science, the species will be named after Means.

PHOTOS: BRUCE MEANS

the Ouachita Mountains. Sitting down for a rest after digging a large hole, Means watched wordlessly as a large earthworm suddenly spilled out of the fresh-dug earth at his feet. Plop, a full species completely new to science. The worm now bears his name: *Diplocardia meansi.*

In the mid-sixties, Means was traveling down Highway 65, a lonely artery through the heart of the Apalachicola National Forest, when he spotted an unusual-looking snake dead in the road. Pulling over, he collected the road kill and took it back to Tallahassee. He'd found a whole new subspecies of the eastern kingsnake. It, too, will soon bear his moniker, says Ken Krysko, who is submitting the final description of the animal to the scientific literature next year.

Means' latest adventures in South America have yielded a bonanza for tropical herpetology (the study of snakes and amphibians). Though awaiting confirmation, Means expects his finds will put six new species of frogs and tree toads into the literature.

Is he just luckier than most professional critter-gitters? Possibly, but Means says the key to his success in finding things really boils down to practice.

"When you spend as much time in the field as I do, you get better at it than the average person. It's just a matter of becoming familiar with your environment—when I first get into a new place I don't have a clue."

Means said that field biologists learn to develop a "search image," a heightened sense of awareness that in essence gives them a new set of eyes. In his case, it's a "kind of gestalt," he says, that helps shape his own search image to hone in on whatever he's after.

His recent discovery of what he thinks is a new species of tree-climbing toad in Guyana is a perfect example, he said.

After finding one of the tiny creatures clinging to a leaf in a midnight rainstorm, Means searched futilely for others for several nights thereafter. He knew the animals were there—he simply couldn't find them no matter where or how hard he looked.

Finally, again in a late-night downpour (this research isn't for couch potatoes) Means found five of the creatures huddling on the undersides of very small leaves. It was the clue he needed—the toads liked small leaves, not big ones or even tree bark or limbs for that matter. The next night Means quickly collected 14 specimens—all from small leaves.

"They were right around me the whole time!" he exclaimed, laughing. "I just didn't know where to look."

FINAL ROLL-CALL FOR PARADISE?

As Hurricane Ivan roared toward Florida's Panhandle last September, a visitor standing on the wind-swept, abandoned beaches of Panama City could count 29 immense construction cranes standing frozen like giant praying mantises from the eastern horizon to the west.

The coastal city was spared the worst of that storm, but the unrelenting maelstrom of development—fiercer by far than anything Florida has ever faced by nature—is something else again.

For decades, Florida has stood in the crosshairs of a human onslaught. The flood of refugees from colder climes and depressed economies elsewhere has conspired with the state's historic role as the nation's fun-in-the-sun playground to squeeze key resources—primarily land appropriate for development and clean drinking water—to the brink of crisis in certain parts of the state.

In the face of these self-inflicted—indeed in the eyes of many boosters, *welcomed*—problems, it's little wonder that the plights of the pine barren tree frog, the gopher tortoise, the Suwannee cooter, the flatwoods salamander, the southern coal skink, the Florida mouse or the eastern indigo snake command so little attention.

All of these species once were common in lush, longleaf-filled plains—now packed with Wal-Marts, shopping malls, resorts and golf courses—but now are threatened or endangered. The list of plants and animals teetering on the edge of extinction, already long, seems to grow with the rise of every new subdivision in the coastal plains states.

In a chapter he contributed to *Between Two Rivers*, a collection of stories published in September by a group of North Florida environmental writers, Means reflected on what he's witnessed as a biologist who's finger has been on the pulse of paradise for four decades.

At a creek where he once caught tiger salamanders, scurrying

TURTLE TERROR: Means lifts a 90-lb alligator snapping turtle, *Macrochelys temmincki,* that he caught while scuba diving in the Apalachicola River this summer. The turtle will "star" in an episode of the Austin Stevens *Snake Master* series which debuted in the fall on the Discovery Channel. Then the animal will be returned to its river home, Means said.

to spawn on cold, rainy, mid-winter nights, he now goes for check-ups at his HMO. He hasn't laid eyes on a tiger salamander in 20 years. During this period, he's watched two of his other favorite salamanders—the flatwoods and the Southern dusky—nearly disappear as well.

The snake that he found in 1965 and that soon will bear his name—the subspecies of the eastern kingsnake once so common to the piney woodlands around Tallahassee and now scarce itself—may in fact now be extinct in the wild. He keeps a half-grown specimen, which he raised in captivity, in a cage above his desk.

Means used to catch the Southern hognose snake routinely in southern Leon County. Any Southern country boy older that 40 remembers the harmless, blunt-nosed snake that would instantly roll onto its back and play dead when disturbed. The last hognose Means found in the wild was in 1990. A nine-year hunt using special traps yielded not a single specimen.

The litany goes on—in the 1990s, Means and his youngest son Ryan conducted long studies of the fauna that inhabit an abundance of small ponds on the fringes of the Apalachicola National Forest. They found sharply diminished populations of two species of newts, two species of salamanders and one type of frog.

BEAUTIFUL DREAMER

In the 19th century, the coastal plains lost its bison, shot to extinction by early settlers, and in the 20th it lost the red wolf, the passenger pigeon, the Carolina parakeet, the ivory-billed woodpecker and came close to losing the Florida panther and the sturgeon.

In the dim light of all this, Means is guardedly optimistic about what the new century holds. He especially likes what he sees in the state's willingness to buy up sensitive lands and lock them away from developers.

"We have the best land acquisition, land preservation programs of any state in the nation, and we have lots of federal lands as well. This is the best chance we have in North Florida of protecting what's left of the old longleaf ecosystem."

Still, Means admits that even the best land acquisition programs are ultimately likely to fail if citizens don't understand why saving a salamander, a bird, a frog, a fish, a snake, a flower or a tree is more important than having a more convenient shopping mall.

An ominous sign of public ignorance (or indifference) over the matter, says Means, is current support in Congress for gutting the Endangered Species Act. Environmentalists regard the act as the last best hope for keeping what's left of the nation's natural areas intact.

But Means seems to draw considerable solace from a belief in the intrinsic power of nature's beauty to thwart a final death blow from human ignorance and greed. Over the years, he's taken delight in seeing young people get viscerally excited over a cypress bog, a meadow of flowering grasses, a noisy family of fox squirrels, a fiery cleansing of a forest floor, even a mucky slog through acres of prickly needlegrass.

Now a granddad twice over, he's buoyed, too, by the thoughts of passing along whatever conservation genes he has to help tomorrow's generation carry on the environmental torch. He can scarcely talk without mentioning his sons, Harley—now 36 and a state geologist—and Ryan, 32, a passionate herpetologist.

The brothers' best memories blend scenes of their dad wrangling rattlesnakes in the piney woods of Tall Timbers with funny images of him bubbling to the surface of tannic rivers bearing perfect, centuries-old arrowheads in his diving mask. Harley says his two sons, ages 12 and 10, regard their granddad as a TV celebrity and hang onto his every word.

It's riches such as this that Means may have had in mind when he resolved his mountain of doubt about a career so long ago. He was right from the start—money can't touch what makes you truly happy to be alive. This kind of joy is what gets him up every morning and puts a spring in his step.

"The game isn't lost yet," Means said, smiling. "The key is to get people to appreciate the beauty of nature—the interconnectedness of it all—so that they'll understand it and want to fight to save it.

"After all I've seen in this life, that's the only answer I know." —RR

LIKE FATHER, LIKE SONS seems to be a Means family theme. Both of Means' sons, Harley (in cap) and Ryan, are ardent naturalists who pursue careers in research and conservation management in North Florida.