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A Teacher on the Front Line as Faith and Science Clash

By [AMY HARMON](#)

ORANGE PARK, Fla. — David Campbell switched on the overhead projector and wrote “Evolution” in the rectangle of light on the screen.

He scanned the faces of the sophomores in his Biology I class. Many of them, he knew from years of teaching high school in this Jacksonville suburb, had been raised to take the biblical creation story as fact. His gaze rested for a moment on Bryce Haas, a football player who attended the 6 a.m. prayer meetings of the Fellowship of Christian Athletes in the school gymnasium.

“If I do this wrong,” Mr. Campbell remembers thinking on that humid spring morning, “I’ll lose him.”

In February, the [Florida](#) Department of Education modified its standards to explicitly require, for the first time, the state’s public schools to teach evolution, calling it “the organizing principle of life science.” Spurred in part by legal rulings against school districts seeking to favor religious versions of natural history, over a dozen other states have also given more emphasis in recent years to what has long been the scientific consensus: that all of the diverse life forms on Earth descended from a common ancestor, through a process of mutation and natural selection, over billions of years.

But in a nation where evangelical Protestantism and other religious traditions stress a literal reading of the biblical description of God’s individually creating each species, students often arrive at school fearing that evolution, and perhaps science itself, is hostile to their faith.

Some come armed with “Ten questions to ask your biology teacher about evolution,” a document circulated on the Internet that highlights supposed weaknesses in evolutionary theory. Others scrawl their opposition on homework assignments. Many just tune out.

With a mandate to teach evolution but little guidance as to how, science teachers are contriving their own ways to turn a culture war into a lesson plan. How they fare may bear on whether a new generation of Americans embraces scientific evidence alongside religious belief.

“If you see something you don’t understand, you have to ask ‘why?’ or ‘how?’ ” Mr. Campbell often admonished his students at Ridgeview High School.

Yet their abiding mistrust in evolution, he feared, jeopardized their belief in the basic power of science to explain the natural world — and their ability to make sense of it themselves.

Passionate on the subject, Mr. Campbell had helped to devise the state's new evolution standards, which will be phased in starting this fall. A former Navy flight instructor not used to pulling his punches, he fought hard for their passage. But with his students this spring, he found himself treading carefully, as he tried to bridge an ideological divide that stretches well beyond his classroom.

A Cartoon and a Challenge

He started with Mickey Mouse.

On the projector, Mr. Campbell placed slides of the cartoon icon: one at his skinny genesis in 1928; one from his 1940 turn as the impish Sorcerer's Apprentice; and another of the rounded, ingratiating charmer of Mouse Club fame.

"How," he asked his students, "has Mickey changed?"

Natives of Disney World's home state, they waved their hands and called out answers.

"His tail gets shorter," Bryce volunteered.

"Bigger eyes!" someone else shouted.

"He looks happier," one girl observed. "And cuter."

Mr. Campbell smiled. "Mickey evolved," he said. "And Mickey gets cuter because Walt Disney makes more money that way. That is 'selection.' "

Later, he would get to the touchier part, about how the minute changes in organisms that drive biological change arise spontaneously, without direction. And how a struggle for existence among naturally varying individuals has helped to generate every species, living and extinct, on the planet.

For now, it was enough that they were listening.

He strode back to the projector, past his menagerie of snakes and baby turtles, and pointed to the word he had written in the beginning of class.

"Evolution has been the focus of a lot of debate in our state this year," he said. "If you read the newspapers, everyone is arguing, 'is it a theory, is it not a theory?' The answer is, we can observe it. We can see it happen, just like you can see it in Mickey."

Some students were nodding. As the bell rang, Mr. Campbell stood by the door, satisfied. But Bryce, heavysset with blond curls, left with a stage whisper as he slung his knapsack over his shoulder.

“I can see something else, too,” he said. “I can see that there’s no way I came from an ape.”

Fighting for a Mandate

As recently as three years ago, the guidelines that govern science education in more than a third of American public schools gave exceedingly short shrift to evolution, according to reviews by education experts. Some still do, science advocates contend. Just this summer, religious advocates lobbied successfully for a Louisiana law that protects the right of local schools to teach alternative theories for the origin of species, even though there are none that scientists recognize as valid. The Florida Legislature is expected to reopen debate on a similar bill this fall.

Even states that require teachers to cover the basics of evolution, like natural selection, rarely ask them to explain in any detail how humans, in particular, evolved from earlier life forms. That subject can be especially fraught for young people taught to believe that the basis for moral conduct lies in God’s having created man uniquely in his own image.

The poor treatment of evolution in some state education standards may reflect the public’s widely held creationist beliefs. In Gallup polls over the last 25 years, nearly half of American adults have consistently said they believe God created all living things in their present form, sometime in the last 10,000 years. But a 2005 defeat in federal court for a school board in Dover, Pa., that sought to cast doubt on evolution gave legal ammunition to evolution proponents on school boards and in statehouses across the country.

In its wake, Ohio removed a requirement that biology classes include “critical analysis” of evolution. Efforts to pass bills that implicitly condone the teaching of religious theories for life’s origins have failed in at least five states. And as science standards come up for regular review, other states have added material on evolution to student achievement tests, and required teachers to spend more time covering it.

When Florida’s last set of science standards came out in 1996, soon after Mr. Campbell took the teaching job at Ridgeview, he studied them in disbelief. Though they included the concept that biological “changes over time” occur, the word evolution was not mentioned.

He called his district science supervisor. “Is this really what they want us to teach for the next 10 years?” he demanded.

In 2000, when the independent Thomas B. Fordham Foundation evaluated the evolution education standards of all 50 states, Florida was among 12 to receive a grade of F. (Kansas, which drew international attention in 1999 for deleting all mention of evolution and later embracing supernatural theories, received an F-minus.)

Mr. Campbell, 52, who majored in biology while putting himself through [Cornell University](#) on a Reserve Officers Training Corps scholarship, taught evolution anyway. But like nearly a third of biology teachers across the country, and more in his politically conservative district, he regularly

heard from parents voicing complaints.

With no school policy to back him up, he spent less time on the subject than he would have liked. And he bit back his irritation at Teresa Yancey, a biology teacher down the hall who taught a unit she called “Evolution or NOT.”

Animals do adapt to their environments, Ms. Yancey tells her students, but evolution alone can hardly account for the appearance of wholly different life forms. She leaves it up to them to draw their own conclusions. But when pressed, she tells them, “I think God did it.”

Mr. Campbell was well aware of her opinion. “I don’t think we have this great massive change over time where we go from fish to amphibians, from monkeys to man,” she once told him. “We see lizards with different-shaped tails, we don’t see blizzards — the lizard bird.”

With some approximation of courtesy, Mr. Campbell reminded her that only a tiny fraction of organisms that ever lived had been preserved in fossils. Even so, he informed his own students, scientists have discovered thousands of fossils that provide evidence of one species transitioning into another — including feathered dinosaurs.

But at the inaugural meeting of the Florida Citizens for Science, which he co-founded in 2005, he vented his frustration. “The kids are getting hurt,” Mr. Campbell told teachers and parents. “We need to do something.”

The Dover decision in December of that year dealt a blow to “intelligent design,” which posits that life is too complex to be explained by evolution alone, and has been widely promoted by religious advocates since the [Supreme Court](#)’s 1987 ban on creationism in public schools. The federal judge in the case called the doctrine “creationism re-labeled,” and found the Dover school board had violated the constitutional separation of church and state by requiring teachers to mention it. The school district paid \$1 million in legal costs.

Inspired, the Florida citizens group soon contacted similar groups in other states advocating better teaching of evolution. And in June 2007, when his supervisor invited Mr. Campbell to help draft Florida’s new standards, he quickly accepted.

During the next six months, he made the drive to three-day meetings in Orlando and Tallahassee six times. By January 2008 the Board of Education budget had run out. But the 30 teachers on the standards committee paid for their own gasoline to attend their last meeting.

Mr. Campbell quietly rejoiced in their final draft. Under the proposed new standards, high school students could be tested on how fossils and DNA provide evidence for evolution. Florida students would even be expected to learn how their own species fits into the tree of life.

Whether the state’s board of education would adopt them, however, was unclear. There were heated objections from some religious organizations and local school boards. In a stormy public

comment session, Mr. Campbell defended his fellow writers against complaints that they had not included alternative explanations for life's diversity, like intelligent design.

His attempt at humor came with an edge:

"We also failed to include astrology, alchemy and the concept of the moon being made of green cheese," he said. "Because those aren't science, either."

The evening of the vote, Mr. Campbell learned by e-mail message from an education official that the words "scientific theory of" had been inserted in front of "evolution" to appease opponents on the board. Even so, the standards passed by only a 4-to-3 vote.

Mr. Campbell cringed at the wording, which seemed to suggest evolution was a kind of hunch instead of the only accepted scientific explanation for the great variety of life on Earth. But he turned off his computer without scrolling through all of the frustrated replies from other writers. The standards, he thought, were finally in place.

Now he just had to teach.

The Limits of Science

The morning after his Mickey Mouse gambit, he bounced a pink rubber Spalding ball on the classroom's hard linoleum floor.

"Gravity," he said. "I can do this until the end of the semester, and I can only assume that it will work the same way each time."

He looked around the room. "Bryce, what is it called when natural laws are suspended — what do you call it when water changes into wine?"

"Miracle?" Bryce supplied.

Mr. Campbell nodded. The ball hit the floor again.

"Science explores nature by testing and gathering data," he said. "It can't tell you what's right and wrong. It doesn't address ethics. But it is not anti-religion. Science and religion just ask different questions."

He grabbed the ball and held it still.

"Can anybody think of a question science can't answer?"

"Is there a God?" shot back a boy near the window.

"Good," said Mr. Campbell, an Anglican who attends church most Sundays. "Can't test it. Can't prove it, can't disprove it. It's not a question for science."

Bryce raised his hand.

“But there is scientific proof that there is a God,” he said. “Over in Turkey there’s a piece of wood from Noah’s ark that came out of a glacier.”

Mr. Campbell chose his words carefully.

“If I could prove, tomorrow, that that chunk of wood is not from the ark, is not even 500 years old and not even from the right kind of tree — would that damage your religious faith at all?”

Bryce thought for a moment.

“No,” he said.

The room was unusually quiet.

“Faith is not based on science,” Mr. Campbell said. “And science is not based on faith. I don’t expect you to ‘believe’ the scientific explanation of evolution that we’re going to talk about over the next few weeks.”

“But I do,” he added, “expect you to understand it.”

The Lure of T. Rex

Over the next weeks, Mr. Campbell regaled his students with the array of evidence on which evolutionary theory is based. To see how diverse species are related, they studied the embryos of chickens and fish, and the anatomy of horses, cats, seals and bats.

To simulate natural selection, they pretended to be birds picking light-colored moths off tree bark newly darkened by soot.

But the dearth of questions made him uneasy.

“I still don’t have a good feeling on how well any of them are internalizing any of this,” he worried aloud.

When he was 5, Mr. Campbell’s aunt took him on a trip from his home in Connecticut to the [American Museum of Natural History](#) in New York City. At the end of the day, she had to pry him away from the Tyrannosaurus rex.

If this didn’t hook them, he thought one Wednesday morning, admiring the cast of a T. rex brain case he set on one of the classroom’s long, black laboratory tables, nothing would. Carefully, he distributed several other fossils, including two he had collected himself.

He placed particular hope in the jaw of a 34-million-year-old horse ancestor. Through chance, selection and extinction, he had told his class, today’s powerfully muscled, shoulder-high horses

had evolved from squat dog-sized creatures.

The diminutive jaw, from an early horse that stood about two feet tall, offered proof of how the species had changed over time. And maybe, if they accepted the evolution of *Equus caballus*, they could begin to contemplate the origin of *Homo sapiens*.

Mr. Campbell instructed the students to spend three minutes at each station. He watched Bryce and his partner, Allie Farris, look at the illustration of a modern horse jaw he had posted next to the fossil of its *Mesohippus* ancestor. Hovering, he kicked himself for not acquiring a real one to make the comparison more tangible. But they lingered, well past their time limit. Bryce pointed to the jaw in the picture and held the fossil up to his own mouth.

“It’s maybe the size of a dog’s jaw or a cat’s,” he said, measuring.

He looked at Allie. “That’s pretty cool, don’t you think?”

After class, Mr. Campbell fed the turtles. It was time for a test, he thought.

‘I Don’t Believe in This’

Bryce came to Ridgeview as a freshman from a Christian private school where he attended junior high.

At 16, Bryce, whose parents had made sure he read the Bible for an hour each Sunday as a child, no longer went to church. But he did make it to the predawn meetings of the Fellowship of Christian Athletes, a national Christian sports organization whose mission statement defines the Bible as the “authoritative Word of God.” Life had been dark after his father died a year ago, he told the group, but things had been going better recently, and he attributed that to God’s help.

When the subject of evolution came up at a recent fellowship meeting, several of the students rolled their eyes.

“I think a big reason evolutionists believe what they believe is they don’t want to have to be ruled by God,” said Josh Rou, 17.

“Evolution is telling you that you’re like an animal,” Bryce agreed. “That’s why people stand strong with Christianity, because it teaches people to lead a good life and not do wrong.”

Doug Daugherty, 17, allowed that he liked science.

“I’ll watch the Discovery Channel and say ‘Ooh, that’s interesting,’ ” he said. “But there’s a difference between thinking something is interesting and believing it.”

The last question on the test Mr. Campbell passed out a week later asked students to explain two forms of evidence supporting evolutionary change and natural selection.

“I refuse to answer,” Bryce wrote. “I don’t believe in this.”

Losing Heart

Mr. Campbell looked at the calendar. Perhaps this semester, he thought, he would skip over the touchy subject of human origins. The new standards, after all, had not gone into effect. “Maybe I’ll just give them the fetal pig dissection,” he said with a sigh.

It wasn’t just Bryce. Many of the students, Mr. Campbell sensed, were not grasping the basic principles of biological evolution. If he forced them to look at themselves in the evolutionary mirror, he risked alienating them entirely.

The discovery that a copy of “Evolution Exposed,” published by the creationist organization Answers in Genesis, was circulating among the class did not raise his flagging spirits. The book lists each reference to evolution in the biology textbook Mr. Campbell uses and offers an explanation for why it is wrong.

Where the textbook states, for example, that “Homo sapiens appeared in Africa 200,000 years ago based on fossil and DNA evidence,” “Exposed” counters that “The fossil evidence of hominids (alleged human ancestors) is extremely limited.” A pastor at a local church, Mr. Campbell learned, had given a copy of “Exposed” to every graduating senior the previous year.

But the next week, at a meeting in Tallahassee where he sorted the new science standards into course descriptions for other teachers, the words he had helped write reverberated in his head.

“Evolution,” the standards said, “is the fundamental concept underlying all biology.”

When he got home, he dug out his slide illustrating the nearly exact match between human and chimpanzee chromosomes, and prepared for a contentious class.

Facing the Challenge

“True or false?” he barked the following week, wearing a tie emblazoned with the DNA double helix. “Humans evolved from chimpanzees.”

The students stared at him, unsure. “True,” some called out.

“False,” he said, correcting a common misconception. “But we do share a common ancestor.”

More gently now, he started into the story of how, five or six million years ago, a group of primates in Africa split. Some stayed in the forest and evolved into chimps; others — our ancestors — migrated to the grasslands.

On the projector, he placed a picture of the hand of a gibbon, another human cousin. “There’s the opposable thumb,” he said, wiggling his own. “But theirs is a longer hand because they live in

trees, and their arms are very long.”

Mr. Campbell bent over, walking on the outer part of his foot. He had intended to mimic how arms became shorter and legs became longer. He planned to tell the class how our upright gait, built on a body plan inherited from tree-dwelling primates, made us prone to lower back pain. And how, over the last two million years, our jaws have grown shorter, which is why wisdom teeth so often need to be removed.

But too many hands had gone up.

He answered as fast as he could, his pulse quickening as it had rarely done since his days on his high school debate team.

“If that really happened,” Allie wanted to know, “wouldn’t you still see things evolving?”

“We do,” he said. “But this is happening over millions of years. With humans, if I’m lucky I might see four generations in my lifetime.”

Caitlin Johnson, 15, was next.

“If we had to have evolved from something,” she wanted to know, “then whatever we evolved from, where did IT evolve from?”

“It came from earlier primates,” Mr. Campbell replied.

“And where did those come from?”

“You can trace mammals back 250 million years,” he said. The first ones, he reminded them, were small, mouselike creatures that lived in the shadow of dinosaurs.

Other students were jumping in.

“Even if we did split off from chimps,” someone asked, “how come they stayed the same but we changed?”

“They didn’t stay the same,” Mr. Campbell answered. “They were smaller, more slender — they’ve changed a lot.”

Bryce had been listening, studying the hand of the monkey on the screen .

“How does our hand go from being that long to just a smaller hand?” he said. “I don’t see how that happens.”

“If a smaller hand is beneficial,” Mr. Campbell said, “individuals with small hands will have more children, while those with bigger hands will disappear.”

“But if we came from them, why are they still around?”

“Just because a new population evolves doesn’t mean the old one dies out,” Mr. Campbell said.

Bryce spoke again. This time it wasn’t a question.

“So it just doesn’t stop,” he said.

“No,” said Mr. Campbell. “If the environment is suitable, a species can go on for a long time.”

“What about us,” Bryce pursued. “Are we going to evolve?”

Mr. Campbell stopped, and took a breath.

“Yes,” he said. “Unless we go extinct.”

When the bell rang, he knew that he had not convinced Bryce, and perhaps many of the others. But that week, he gave the students an opportunity to answer the questions they had missed on the last test. Grading Bryce’s paper later in the quiet of his empty classroom, he saw that this time, the question that asked for evidence of evolutionary change had been answered.

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