Lifelong pursuit of the secrets of the cosmos

April 22 2011, By Kurt Streeter

In a small room at Caltech, space physicist Ed Stone and four of his colleagues puzzle over a trove of data that has just arrived from the bulbous edge of the solar system.

"What, exactly, are we looking at?" Stone asks.

The data form a map of invisible matter, a slush of atomic particles once part of stars that exploded around 10 million years ago. The information has come from Voyager 1, the spindly little spacecraft that rocketed from Florida more than 30 years before and is still traveling, farther from Earth than any human-made object ever has.

Stone and his associates are stumped. "What are we going to find?" Stone wonders. "Right now, I don't think anybody knows."

The godfather of the interstellar mission called Voyager is now 75. He is rail thin, and his shoulders have a faint slope. A crown of gray hair circles the top of his otherwise bald head. He is wearing his standard work attire: gray sport jacket, gray pants, gray shoes, gray socks - and a white shirt.

Despite his uncertainty, his voice is calm. "Eventually," he assures the others, "we're going to figure this out."

Stone is agnostic about God, but has a belief that knowing about the cosmos brings deeper understanding of Earth. Although he and the other scientists might not comprehend Voyager's observations right now,

experience tells him their meanings will be divined.

He also believes they will learn much more. Voyager 1 is close to bursting out of the solar system. Once it makes it beyond the influence of the sun, the spacecraft will enter part of the universe that scientists have only been able speculate about: Deep space.

"We're very, very close," Stone says, after the meeting with his collaborators. "We can't say for sure how long it is going to take to get there. My best guess is four years, maybe five."

That would make him 79 or 80. Projections have fallen short at times during this mission. Deep space still might be a decade away.

"Will I be around when Voyager finally makes it?" Stone draws a breath. For a moment, he is silent.

Edward Carroll Stone was born in Iowa in 1936, when putting a man on the moon was the stuff of fiction and textbooks speculated about a jungle-covered Mars. He grew up in a humble house in Burlington, where his father ran a small construction business and his mother kept the company books. In grade school, he pored over Popular Science magazine, with its tales of the Atomic Age. He took apart his transistor radio and put it back together, just for kicks. Then he did it again.

Stone had a brilliant mind. In 1957, when he was a graduate student studying space physics at the University of Chicago, the Soviet Union launched Sputnik. "Just like that, because of the Cold War and our need to match Sputnik," he says, "a whole new realm absolutely opened up."

In 1961, the Air Force put a device measuring solar winds he had proposed for his doctoral dissertation on board one of its satellites. After that success, he joined the faculty at Caltech and created more space

experiments, this time for NASA. For a long while, times were good. Government aid gushed to NASA, which basked in the warm glow of its moon shots. Movies like "2001: A Space Odyssey" and "Star Wars" spoke to the wonders of exploration.

Voyagers 1 and 2, twin unmanned NASA probes, shot skyward in 1977. Five years earlier, Stone had become their project scientist - the overseer of all the experiments and myriad measuring devices they would carry. It was meant to be a part-time job along with his ongoing role as a Caltech professor, but he worked 100 hours a week at times, guiding 11 investigative teams and managing 200 researchers.

The Voyagers captured national attention. Part of the fascination was the audacity of the goal: to make drive-by visits to the planets and then go beyond - way, way beyond. And there was Carl Sagan, the charismatic space physicist and storyteller who spoke of the mission in mythical terms.

It was Sagan's idea to affix each Voyager with what became a hallmark: a gold-plated record showing Earth's position among the stars that could also play songs and greetings. Sagan speculated the probes would be found by intelligent life, and the discs read, heard and understood.

Stone liked the idea - not because he believed the Voyagers would ever be found, but because having the ability to send spacecraft into deep space and adorn them with a sampling of earthly culture said something profound about how far humankind had come and where it was headed. "It was a wonderful notion," Stone says.

"At the time, though, just making it to Saturn was what I focused on."

Stone became the daily spokesman for the project. He was on the evening news, featured in People magazine. Today, on his office shelves,

he keeps a row of 43 black and green notebooks detailing the Voyagers' trip. He thumbs through them every now and then.

1979. Jupiter, wracked with violent storms and circled by a moon, Io, which was pocked with active volcanoes, a revelation to scientists who had thought the only active volcanoes were on Earth.

1980. Saturn - at last - circled by complex, colorful rings made of icy shards as large as houses and a cluster of moons, including Titan, where it rains liquid gas.

1986. Uranus, with a tilting, off-center magnetic field that was previously unimaginable.

1989. Neptune, with winds kicking up to 1,400 mph and a moon, Triton, speckled with geysers spewing nitrogen.

"What a journey, what a thrill," Stone says, sitting at his spotless, unadorned desk. "It seemed like everywhere we looked, as we encountered those planets and their moons, we were surprised.

"We were finding things we never imagined, gaining a clearer understanding of the environment Earth was part of. I can close my eyes and still remember every part of it."

After Neptune there were no more planets. Voyager 1, farther along than its sister spaceship, pushed onward toward deep space. Stone, flush with the mission's success, became director of the Jet Propulsion Laboratory, a job he held for 10 years. Even though it was a time of budget cuts, downsizing and decreased public expectations, his own star did not diminish.

Space science is stocked with extremely bright and highly competitive

men and women. It is a world of outsized egos and, at times, great clashes of personality and ambition. Yet finding anyone who has a bad word to say about Stone is almost impossible.

What he lacks in zippy personality, his colleagues say, he makes up for by usually being the smartest - and most humble - person in the room. Few, if anyone, can recall him losing his cool or even being mildly dejected. "He is a leader regarded as above the fray," says science writer Timothy Ferris, who helped Sagan create the Voyager discs.

"Stone is pretty much universally admired, and that is very unusual for someone in his position."

In 2001, at age 65, Stone retired from JPL and returned to Caltech to teach physics. By then, much of the machinery on the Voyagers had been shuttered to save power for the final push. Their next important discoveries would come only as they began escaping the solar system.

Science has created models of deep space, but no one can say for sure what it is like - its temperatures, its composition or the speed of its interstellar wind. Most important, no one knows exactly how deep space relates to the formation of Earth.

Stone, still the lead scientist, oversees a slimmed-down Voyager team - about 20 researchers who must find time for the mission among their other projects. Some are at Caltech and JPL, others at universities and laboratories scattered across the country.

They follow the probes, especially Voyager 1, with mounting interest. Running on dwindling plutonium, using antiquated computers and recording data on eight-track tapes that get sent to Earth on faint radio waves, Voyager 2 races through space about 9 billion miles away and Voyager 1, 11 billion.

If it reaches deep space, scientists will ask Voyager 1 to perform one more great task before it runs out of power, to use a collection of measuring devices, including one known as a cosmic-ray spectrometer, which Stone helped design, to gather information and send it back to Earth. Humans then will have their first definitive look at the great beyond.

Stone is devoted to his wife of 48 years, Alice, their two grown daughters and two grandchildren. But he still often works seven days a week and cannot imagine retirement. In addition to teaching physics and managing the Voyager mission, he is helping to lead the construction of a massive telescope in Hawaii that will be among the world's most powerful.

Other than attending the symphony on occasion, he has nothing in the way of hobbies. "I don't mean this any way but the best sense," says fellow Caltech professor Andy Ingersoll, "but Ed Stone is in some ways like a machine. He has always been that way."

So Stone keeps pushing ahead for answers.

How large is the edge of the solar system? How long will it take Voyager 1 to pass through it, to reach that vast region where the sun's cosmic wind finally stops? What will it find there?

Will he be around when it happens?

The truth, he says, is that he can't afford to think about that very much. "There is too much to do."

He pauses.

"As far as what will happen to me, nature will have its way, I

understand," Stone says. "Even if I am not there we will keep exploring, keep figuring out the science. I'm optimistic about this."