San Jose State students report major discovery in space

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A San Jose State undergrad grieving the loss of his mother shifted his gaze to outer space and made what could prove to be a remarkable discovery: a system of stars so dense, his professor said, astronomy has no word for it.

In only a week 21-year-old Michael Sandoval stumbled upon what he and his professor have named a hypercompact cluster, which they argue is the intensely starry remains of one galaxy that has been consumed by another.

Astrophysics professor Aaron Romanowsky said it's astounding how quickly his student may have discovered what "some people take years and never find."

The stellar search was a welcome diversion for Sandoval, whose mother, Holly Houser, died of cancer in October. In the last years of his mom's life, the physics major lived at home, juggling her care with his education, sometimes rushing her to the emergency room at night and dragging himself to class the next day from Fremont.

Months later, enrolled in his first astrophysics course, he learned classmate Richard Vo had discovered an unusual stellar object - possibly the densest ever found.

His reaction was immediate: "I want to find one too."

With free, publicly available data from the Hubble Space Telescope archive and the Sloan Digital Sky Survey, Sandoval set to work on his laptop, combing the universe using some of Vo's research methods. "I didn't want to be sitting home, feeling sorry for myself," said Sandoval, the younger of two brothers who both took care of their mother after her diagnosis. "That's not what she would have wanted anyway."

Instead, he and Vo are rushing to publish their findings with Romanowsky, a temporary staff researcher at the University of California, Santa Cruz before joining the San Jose State faculty in 2012.

Romanowsky was on a team of astronomers from a number of universities that was among the first to discover a dense galaxy like the one Vo found: an ultracompact dwarf galaxy. They published their findings in The *Astrophysical Journal* in September.

But Sandoval's search for a similar object turned up something "weird," Romanowsky said, unlike anything he had seen.

If a dwarf galaxy is like an apple core, Romanowsky said, what Sandoval found is like the seeds.

They are keeping the names and locations of both findings secret until they have been published.

Their discoveries, though yet to be reviewed by other scientists, reveal what's possible today in undergraduate science education, particularly at teaching universities like San Jose State that don't have fancy equipment or massive research budgets, Romanowsky said.

One reason a pair of undergraduates might have pulled off this feat is that until recently, astronomers simply weren't looking for these dense stellar systems.

"It's something that's been hiding in plain sight," Romanowsky said.

If verified, their research could lead to breakthroughs in our understanding of the universe - and of the black holes within galaxies, which have a gravitational pull so powerful they are thought to trap light, making them difficult to spot.

Both students were so passionate about the project, Romanowsky said, that they were pushing him, not the other way around. "They're sending me emails at midnight: 'Professor, will you send me more data?' " he said.

Experiences like theirs could bring more students into the sciences, said Natalie Batalha, a research astronomer at NASA Ames Research Center. Glimpsing something no human has ever seen feels like "all the mysteries of the universe are right there for us to discover," she said.

"Not very many young people are choosing to pursue scientific careers," she added, "and I wonder how much of that is because of stereotypes and a poor understanding of what it means to be a scientist."

Between his forearm tattoos and outspoken, boyish sense of humor, Vo certainly shatters the boring-scientist stereotype. Recalling the start of his research project, he described the task ahead of him then as "basically finding Waldo."

The youngest of 10 children of Vietnamese immigrants, Vo graduated from San Jose State on Saturday with a physics degree. He hopes to continue his research at San Francisco State.

Sandoval's foray into astronomy makes him think of his mom. It always embarrassed him when she bragged about his physics studies, he said, because he felt he had done nothing special.

"After this has happened," he said, "I'm pretty sure she's proud."