Satellite will help determine age of universe

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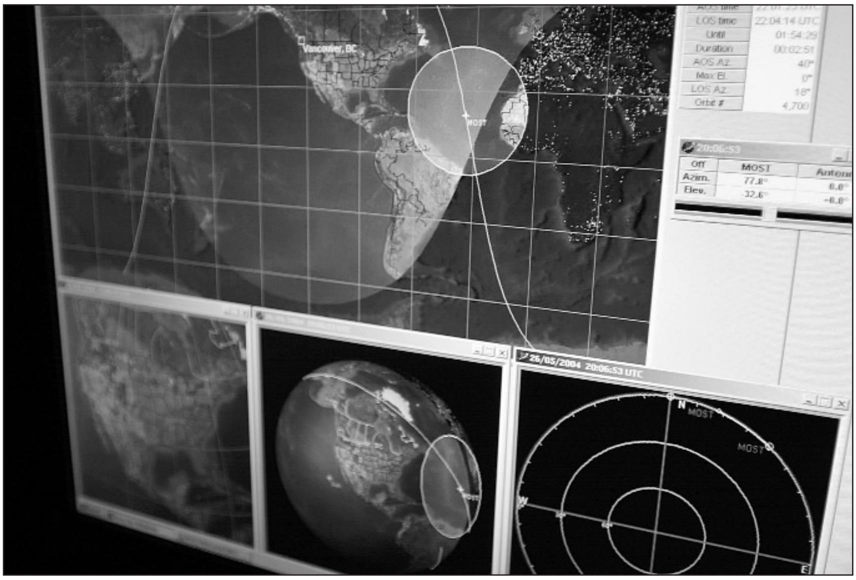
3,000 to 4,000 stars and have determined that about 100 likely have planets orbiting them. The first of these to be examined by MOST is Tau Bootis, 51 light years from Earth. Matthews is still sifting through the data, but he anticipates Tau Bootis will produce "big results."



A computer plots the course of the satellite at MOST Ground Station at the University of B.C. *photo* **Dan Toulgoet**

As the world's smallest space telescope, MOST has been nicknamed the "Humble Space Telescope." But the questions it hopes to answer are big ones. Data gathered by MOST will help astronomers determine the minimum age of the universe, in addition to providing detailed information on individual stars.

How can astronomers determine the age and physical makeup of a star just by looking at changes in the amount of light it emits?

Matthews explained that, to shine, stars fuse hydrogen atoms into helium. The older the star, the more helium it has in its core.

Stars generate turbulence, which creates sound waves, causing them to pulsate and to vary the amount of light they are emitting. Hydrogen is lighter than helium, and sound waves travel through it more quickly. By measuring the oscillations of a star, astronomers can calculate how much helium it contains, and can determine its approximate age.

By determining the age of the oldest stars, astronomers can set a lower limit for the age of our galaxy, and for the universe as a whole. (The universe is currently believed to be between 12 and 14 billion years old.)

Another question Matthews hopes to answer is how stars add gas to the interstellar medium. MOST will be trained on a number of Wolf-Rayet stars—hot, bright, old stars about 20 times as large as the sun.

Extremely rare, Wolf-Rayet stars account for just one out of every 10 million stars. They shed mass in a "stellar wind"—atoms that stream off into space. A single Wolf-Rayet star loses the equivalent of Earth's mass in a single year.

It's also possible, by studying other stars, to learn more about the life cycle of our own sun. The data MOST is collecting will help answer questions about what the sun was like as a "baby" and what it will be like as a "senior citizen."

By studying a wide range of stars, astronomers can collect the pieces that make up the puzzle of how stars change over their lifetime. Because a star's lifetime is measured in billions of years, it's almost impossible to witness stellar evolution in action, says Matthews. "It would be like to trying to study the life cycle of a human being and only having one minute to look at a person and try to see changes." But by looking at humans who range from newborns to the elderly, a more complete picture can be gained.

"Astronomers have the benefit of being able to look at so many stars in so many different stages; we can take snapshots that let us piece together the life of a star."

Learning more about the sun's life cycle, says Matthews, can help us answer questions about Earth—including big questions about climate change and global warming.

"The sun has a profound affect on the climate and life of the Earth," he explains. "The tiniest changes in the sun's luminosity can have an enormous effect on the planet."

Understanding more about how the sun works can help scientists to "remove the sun from the equation" and focus on how human activity alone is affecting Earth's climate.

Even though changes in the sun take place over billions of years, the models of how the sun changes affect the calculations being done today. Take, for example, the "faint sun paradox." According to our current understanding of the sun's life cycle, the sun is 40 per cent brighter than it was four billion years ago. If that's the case, the Earth should have been completely frozen over at that point. Yet geological evidence seems to indicate that temperatures were about the same as they are today. And four billion years ago is when life first appeared on Earth—something that required liquid oceans.

"If we get that kind of stuff wrong, we don't know what we might be getting wrong when we project [the sun's characteristics] forward into the future," says Matthews.

Whatever target MOST focuses on, it's bound to produce some interesting results.

"Nobody's been able to do this before—to stare at a star for a month and see what it does," says Matthews. "Being able to look at stars with this level of detail [will mean that] we're going to be surprised. Stars we thought we understood, we're going to find that they're behaving differently than we had assumed or modeled."