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Stellar evolution

Slowing down in old age

SCIENCE AND TECHNOLOGY

A new way to measure the age of stars

TWO years into its mission, NASA's planet-hunting Kepler space telescope has been a big success. With just four months of data, astronomers have found evidence for more than 1,200 planets circling stars other than the sun. That haul has more than doubled the number known, and suggests such planets are common. One estimate, extrapolating from Kepler's data, is that there are as many as 50 billion planets in the Milky Way alone.

But Kepler — which detects its quarry by noting the minuscule dimming of starlight that occurs when a planet crosses in front of its parent star — can be used for other things, too. In a paper presented on May 23 to the annual meeting of the American Astronomical Society, in Boston, a team led by Soren Meibom of Harvard University used data gathered by the telescope to give astronomers a better idea of how old the stars they study are.

At the moment, getting an accurate idea of stellar age is possible only in unusual circumstances — specifically, if a star is part of a cluster whose members formed from the same cloud of gas. The bigger a star is, the more rapidly it burns up its fuel, and the quicker it becomes a bloated red giant. Since all the stars in a cluster are roughly the same age it is possible, by looking at the masses of stars that have made it to the red giant stage, to calculate the age of the cluster and, consequently, of all its members.

Astronomers who study star clusters have noticed that the speed at which a star of a given mass spins (measured by tracking cool, dark spots on the surface) also seems to vary predictably with age. Young stars spin more quickly than old ones. If that relationship could be firmed up, it would offer a way to measure the age of isolated stars that are not part of clusters — a group that includes almost all the stars currently believed to host planets.

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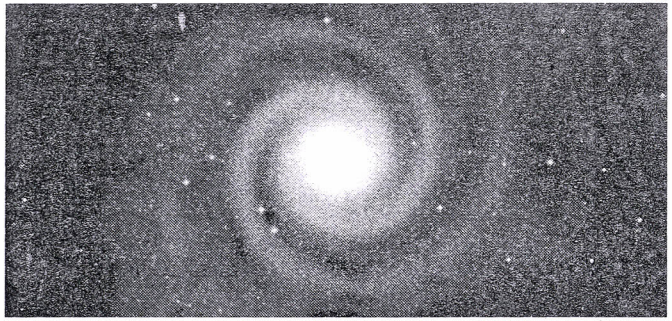

That is easier said than done. The number of spots falls as a star ages. Combined with the difficulties of Earth-based astronomy, which requires that researchers peer through the murk of the atmosphere, that makes it hard to measure the spins of stars older than about 600 million years — a tenth, or less, of the lifetime of a long-lived star. The only data point available for such multi-billion-year-old stars is a particular yellow dwarf in the Orion arm of the Milky Way. This star, which formed around 4.6 billion years ago and takes 26 days to complete one revolution, will be familiar to readers every sunrise.

But Kepler is good at finding spots on stars. It can distinguish them from planets because they are visible for half the time as a star rotates (a planet, by contrast, produces a short dip in stellar illumination). And thanks to its vantage point in space, the craft's telescope can obtain much clearer images than Earth-based instruments. Dr Meibom's paper (to be published soon in Astrophysical Journal Letters) looked at a cluster of stars that is roughly a billion years old, and found that the relationship between age and spin-speed was still tight.

In itself, that is but a small advance. Dr Meibom and his team are, however, in the process of studying a second cluster. This one is 2.5 billion years old. Further clusters within Kepler's field of view are older still, so it should soon be clear whether the relationship continues to hold. If it does, that would have important implications for Kepler's main mission, which is to search for Earthlike planets. After all, one important feature of the Earth is its age, which has given time for complex life to evolve on its surface. For a planet to be truly Earthlike, how long it has been around might be one of its most important features.