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What if our solar system had a companion star?

AUB professor explores this question in a newly published research paper in Nature magazine

Beirut, Lebanon- 15/09/2015 - The interactions of stars, planets and other celestial bodies most probably mean nothing to the average person, aside from the customary daily reading of their horoscope or a romantic moonlit stroll. But for those involved in astrophysics it can reveal the possibility of living forms to exist or not, let alone read horoscopes, in neighboring planetary systems.

A paper titled “The Disruption of Multiplanet Systems Through Resonance with a Binary Orbit,” coauthored by Jihad R. Touma of AUB and S. Sridhar of the Raman Research Institute, Bangalore, India, recently published in [Nature](#) (and highlighted in [Nature Middle East](#) and [Welt Der Physik](#)), proposes a new mechanism that disrupts systems with multiple planets, and could explain the prevalence of single planet systems.

“Our work is in the field of (exo)-planetary science, which is the study of the formation and evolution of planetary systems,” said Touma, AUB physics professor. “We ask questions like how did the solar system form, how stable it is, how does it compare to observed planetary systems around stars nearby, and what does all this have to say about the possibility of life in our cosmic neighborhood.”

For the uninitiated to appreciate the gist of Touma and Sridhar’s paper, without getting lost in mathematical technicalities, two basic ingredients to keep in mind : binary stars and resonance. A binary star can be pictured as a star system made up of two stars that orbit around their center of mass, and is not to be confused with two stars that appear close together to the naked eye from Earth, but in reality are very far apart. In fact, many of the stars we see in the sky are planets, since the naked eye cannot differentiate between the two. However, stars are a collection of gases and plasma that emit light and heat due to the thermonuclear fusion taking place. Meanwhile, planets are celestial bodies, that could be gaseous, rocky, or a combination, orbiting a star.

As for resonance, the simplest would be to consider two guitars side by side, plucking one of the strings on the first guitar then noticing that the similar string will start to vibrate on its own on the second guitar.

“What we are exploring in our work is a resonance mechanism whereby a binary companion star could interfere with and disrupt the orbits of the planets around the parent star,” explained Touma. “This can create havoc on the planets themselves to the extent that they may be ejected from their orbits around the parent star, which would explain growing observational evidence that the number of single-planet systems in binaries is much larger than the number of systems with multiple planets.”

In a typical Star Wars style science fiction scenario, Touma and Sridhar wonder what would happen if a companion star were to orbit around the Sun, and conclude that a likely outcome would be the perturbation of Saturn’s orbit resulting in a major disruption of our outer solar system, with potential consequences for the evolution of Earth and life on it.

“Anyone concerned with the formation and evolution of multi-planet systems will need to allow for the possibility of our mechanism affecting the formation and resulting architecture of planetary systems,” says Touma.

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Note to Editors

About AUB

Founded in 1866, the American University of Beirut bases its educational philosophy, standards, and practices on the American liberal arts model of higher education. A teaching-centered research university, AUB has more than 700 full-time faculty members and a student body of about 8,000 students. AUB currently offers more than 100 programs leading to the bachelor’s, master’s, MD, and PhD degrees. It provides medical education and training to students from throughout the region at its Medical Center that includes a full service 420-bed hospital.

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