NASA awards $1 million for development of platform to detect amino acids

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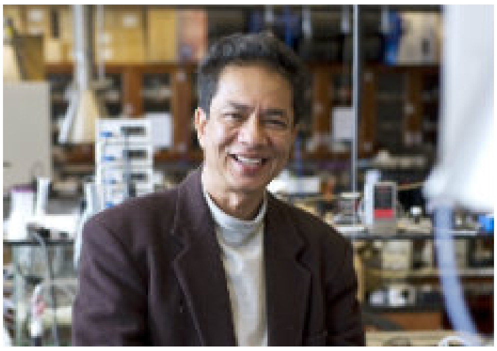

Purnendu "Sandy" Dasgupta, Hamish Small Chair in Ion Analysis of Chemistry and Biochemistry at UT Arlington. Credit: UT Arlington

A University of Texas at Arlington researcher will develop a platform that could help scientists move one step closer to answering whether life may have existed "out there" or if we are really alone in the universe.

Purnendu "Sandy" Dasgupta, Hamish Small Chair in Ion Analysis of Chemistry and Biochemistry in the UT Arlington College of Science, has been awarded almost $1 million from NASA to further the search for amino acids, the so-called building blocks of life.

Dasgupta will do that by extending a platform that he developed to detect and separate ions called an open-tubular capillary chromatography platform. The method uses very small volumes of samples that are injected into tubes extremely small in diameter, between 10 to 25 microns.

"To give you some perspective, the finest human hair is about 100 microns. This is about one-tenth of that. You can't see the holes in those tubes," Dasgupta said. "We have to be much more specific with amino acids than when looking for inorganic ions. But you want the scale to be as small as possible, requiring as little power as possible, and consuming as little material as possible. All of those things have to be carried out to space, and every little bit of weight, volume and power, is expensive."

Dasgupta concedes that his is an ambitious goal and that researchers will have to be much more specific than when looking for ions.

"If we find amino acids, that doesn't necessarily prove it's related to life," he said. "One thing that it fairly unambiguously proves is that it was associated with some life process if the amino acids are dominantly of one chiral form."

Amino acid molecules are chiral, that is, they have a rotational orientation. The rotational orientation of the molecules can be either right-handed or left-handed. All humans are composed of amino acids, but made of only one rotational orientation. Dasgupta said amino acids synthesized in a flask will be composed of equal amounts of both orientation, whereas something coming from a living system wholly or dominantly contains only one orientation (one chiral form).

"This double helix of DNA, for example, makes other DNA molecules by complementing each other," Dasgupta said. "So, it's like a mold. That handedness is preserved. Life is centered on one type of chirality. Our objective, if we can detect amino acids, is to separate the amino acids into chiral forms."

"That means we'll be able to tell whether we have an excess of one chiral form over another, or dominantly just one chiral form. In that case, it would definitely be related to life."

Morteza Khaledi, dean of the UT Arlington College of Science, said Dasgupta's research extends the boundaries of analytical chemistry to outer space.

He will tackle the challenging problems of designing a portable system for liquid-based separation and detection of chiral amino acids in remote and rather hostile environments, Dean Khaledi said.

"This is quite an exciting and important research from both fundamental analytical chemistry as well as potential for important discoveries in our search for evidence of life, as we know it, outside of our planet," he said.

The grant is the latest in a series of recent national and international awards and honors that Dasgupta has earned for his work in chromatography.

"UT Arlington has a distinguished history of working with NASA on various space missions," said Duane Dimos, UT Arlington vice president for research. "This recent grant is a great example of taking advantage of Dr. Dasgupta's capabilities to contribute once more to the NASA mission."

Provided by University of Texas at Arlington