Dr. Steven Willner studying vast concentrations of molecular clouds; findings to be published in The Astrophysical Journal

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Hydrocarbon molecules, the precursors of life, may exist in interstellar space in far greater amounts than previously supposed, according to a research physicist at the University of California, San Diego who has studied vast concentrations of molecules in space called molecular clouds.

"Radio astronomers have known for a long time that hydrocarbon molecules were present in molecular clouds," said Dr. Steven Willner, "but our observations show hydrocarbons in concentrations one thousand times greater than previously thought."

Using infrared spectrophotometry, Willner and his five colleagues have been analyzing a molecular cloud associated with a radio source called W33A in the constellation Sagittarius. Their findings will be published in the August 15 issue of The Astrophysical Journal.

"Molecular clouds are made up mostly of hydrogen (title), helium, silicates, graphite, and carbon monoxide (CO)," said Willner. "But we found features in the spectra showing the presence of hydrocarbon molecules in approximately the same concentration as the CO molecules.

"The significance of this is that the abundance of rather complex molecules in space may be much greater than previously thought," Willner continued. "The CO molecule is composed of just two atoms, for instance, but hydrocarbons are composed of at least four or five atoms and in some cases many more. This says that these complex molecules are much easier to form than we thought."

Willner is not 100 percent certain that the researchers have found hydrocarbon molecules.

"There is a chance they may be a special form of silicates," he cautions. "We first discovered the evidence in other sources, but the features were very much weaker and we thought at that time that they were a special form of silicates, which is why we didn't get very excited. But having found this one source where the features are so much stronger than anything seen from silicates in laboratory measurements, we feel silicates can't produce features like that."

Hydrocarbons, because they are organic molecules, are associated with the formation of life, and Willner speculates that if his observations are accurate, the findings may shed some new light on how life originated on primitive Earth.

" If hydrocarbons are that much easier to form in space than we had thought, then perhaps they were much easier to form on primeval Earth also," he said. "Of course, it is a long way from hydrocarbons to life."

The article to be published, "The 4-8 Micron Spectrum of the Infrared Source W33A," is co-authored by Willner; Dr. Tom Soifer, former assistant professor of physics at UC San Diego and currently a senior research fellow at California Institute of Technology; Rich Puetter, graduate student at UC San Diego; Dr. Ray Russell, research astronomer at Cornell University; Dr. Fred Gillett, staff astronomer at Kitt Peak National Observatory, and Dr. Paul Harvey, research astronomer at the University of Arizona.

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The researchers conducted their studies using a 36 inch telescope mounted aboard a specially modified C-141 aircraft called the Kuiper Airborne Observatory operated by NASA out of Ames Research Center in Northern California.

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