Hannes Alfven says results from spacecraft missions have produced new models of the role of cosmic plasmas in the universe; delivered paper at the American Geophysical Union in San Francisco

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Dr. Hannes Alfven, A Nobel laureate physicist at the University of California, San Diego, says a summary of results from spacecraft missions during the last decade have produced entirely new models of the role of cosmic plasmas in the universe.

In a paper delivered at the December, 1982 meeting of the American Geophysical Union in San Francisco, Alfven said that measurements made in the magnetospheres of Saturn and Jupiter "have drastically changed our understanding of the properties of cosmic plasmas."

Plasmas are hot gasses which are partly or fully ionized (stripped of their electrons) and are capable of conducting electricity and sustaining their own magnetic field.

Until the spacecrafts began sending back their data, plasmas could only be studied in laboratories.

But now it is possible to study plasmas from a billion times farther out in space, and, Alfven says, their properties remain essentially the same as those studied in laboratories on Earth.

There is no way to study plasmas at the interstellar level or at the edge of the universe, Alfven says, because no scientific instruments have reached that far. But, he suggests, a new model of the universe and the role of cosmic plasmas can be made by extrapolating evidence from laboratories and planetary probes into the reaches of interstellar space and beyond.

"Cosmic plasma physics is at present in a state of revision which is so drastic that it is appropriate to speak of a change in paradigm," Alfven said. "This change started five or ten years ago, and it will probably take at least ten years more until the transition is completed."

Alfven believes there is evidence which shows a "cellular" structure to space, which had once thought to be totally devoid of any matter. The "cell walls," according to Alfven, are made up of electric current layers which "separate regions with different magnetisation, different pressure, temperature and chemical composition."

This phenomenon, said Alfven, has already been observed within the solar system, and it is therefore reasonable to assume it exists in the rest of space as well.

"It is unpleasant to postulate the existence of cellular structures in the galaxy if we have no possibilities to observe them," he said. "However, it is obviously still more unpleasant to postulate that a basic property of space changes abruptly at the present outer reach of spacecraft.

"The conclusion must be that space is very likely to posses a general cellular structure," Alfven continued. "Hence we must conclude that also out in galactic and extra-galactic space there are walls separating regions of different magnetisation, density, temperature, chemical composition and maybe different kind of matter."

Alfven says research in cosmic plasma physics can help clear up some of the mysteries about how the rings of Saturn were formed and how the solar system evolved.

"It's application to astrophysics in general, including cosmology, will necessarily lead to a revision of the present theories of the formation of stars, planets and satellites," he concludes. "It is doubtful whether the big bang cosmology will survive."

Alfven, a native of Sweden, is a professor emeritus of applied physics and information science at UCSD. He divides his time between the La Jolla campus and the Royal Institute of Technology in Stockholm.

Alfven is generally regarded as the father of the modern discipline of classical physics known as hydromagnetism. The field has wide application in geophysics, planetary sciences, and astrophysics.

He is the author of the book "Cosmical Electrodynamics," published in 1950, and generally considered a classic in the field. Alfven's most recent book is "Cosmic Plasma," in which he elaborates on the ideas presented during the American Geophysical Union meeting.

He has published more than 100 papers and several books including "The Origin of the Solar System," "Cosmical Electrodynamics, Fundamental Principles," and "World, Anti-Worlds."

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