Astronomy

Cosmic carbon chemistry

Scattered amid cosmic rays and other harsh features, the abundance of complex carbon molecules in interstellar space has perplexed scientists for 30 years. Now, an earthbound combustion laboratory may have solved the mystery of the carbon molecules' origin.

"We wanted insight into the chemistry of outer space," says Arthur G. Suits of the Lawrence Berkeley (Calif.) National Laboratory. Suits and his coauthors show that interstellar carbon chains aren't the product of reactions between charged ions, as was long believed. They report their findings in the Nov. 29 SCIENCE.

The researchers caused a beam of neutral carbon atoms to collide with acetylene, a gas made of carbon and hydrogen, inside a vacuum chamber. The crashes resulted in two versions of the same carbon molecule—a straight chain and a closed ring.

As they varied the beam's energy to simulate different interstellar conditions, the group was able to reproduce the relative abundance of linear and cyclic molecules found near dying stars or inside cold dust clouds.

"It's pretty surprising. People didn't think these reactions happened in space," says James R. Heath of the University of California, Los Angeles, who notes that scientists are already inserting the new results into models of the interstellar medium.

"It just shows the carbon atom is the 500-pound gorilla of chemistry—it does whatever it wants," says Heath.

Galaxies with magnetic personalities

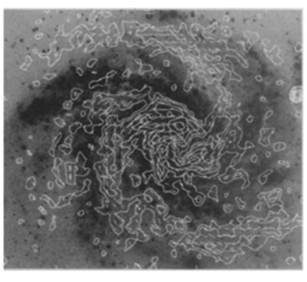
Every spiral galaxy hides an invisible alter ego—the magnetic fields produced by its rotation. Astronomers thought this twin neatly aligned itself with the visible spiral arms, but last January they learned it isn't always so well-behaved. German researchers found a galaxy, NGC 6946, whose magnetic arms are wholly out of phase with the star-filled spirals.

"This new galaxy is probably just the first spotted with lagging magnetic fields," says Yu-Qing Lou of the University of Chicago, coauthor of the report in the Oct. 31 NATURE that analyzes NGC 6946. Lou's model portrays spiral galaxies as spheres of rotating electrified fluids harboring both fast- and slow-moving waves of matter.

Inside a dense galaxy such as NGC 6946, whose stars are bound together tightly by gravity, the spiral arms compress the gas surrounding them. Lou and his colleague, Zuhui Fan, also at the University of Chicago, argue that this compression creates the fast- and slow-moving waves of magnetized material inside galaxies.

Traveling at only a hundredth the speed of the spiral arms, the slow waves trap the magnetic fields seen in NGC 6946. Like thunderclaps after lightning strikes, these waves mark turbulence after the fact. Less dense galaxies, like the Milky Way, lack enough material to harbor such slow magnetic arms and contain only fast waves, according to Lou.

"It's a really interesting and provocative explanation," says Ellen G. Zweibel of the University of Colorado at Boulder, who says astronomers are only now figuring out the implications of NGC 6946. "We need a theory that tells us what causes spiral galaxies and what gets these waves going."



R. Beck/NATURE

A photo negative of galaxy NGC 6946 shows white-outlined magnetic fields between darkened starry spirals.

Biomedicine

John Travis reports from Washington, D.C., at the annual meeting of the Society for Neuroscience

Estrogen eases Alzheimer's symptoms

Indications that estrogen influences cognitive abilities, particularly memory skills, have made the hormone a hot topic among those who study and treat Alzheimer's disease (SN: 2/4/95, p. 74). Reports have even suggested that estrogen supplements can prevent Alzheimer's in some postmenopausal women (SN: 9/7/96, p. 154).

Now, researchers report the first evidence that estrogen can lessen the cognitive decline of elderly women already suffering from the disease. The finding comes from a small trial, involving only a dozen women, which was led by Sanjay Asthana of the Veterans Medical Center in Tacoma, Wash.

Asthana's group treated half the women with a skin patch that delivers estrogen into the blood and gave the other women a similar patch without estrogen. The amount of hormone provided was similar to that used in estrogen replacement therapy to ward off the detrimental aspects of menopause. Within a week, the women getting estrogen showed improvement, says Asthana, while the others did not.

A battery of cognitive tests revealed that the treated women had improved memory skills and were able to concentrate more easily. The degree of cognitive improvement was positively correlated with the amount of estrogen in the blood, notes Asthana. Once the trial ended, the cognitive skills of the women getting the estrogen treatment dropped to previous levels, says Asthana.

Fetal cells tried for Huntington's

The controversy surrounding fetal tissue research has slowed, but not halted, progress in the field. The use of transplanted fetal brain tissue to replace brain cells lost in Parkinson's disease patients has proved promising enough that researchers have begun to test the strategy on people with Huntington's disease, another neurodegenerative disorder. Oleg V. Kopyov of Good Samaritan Hospital in Los Angeles now reports that the first three Huntington's patients receiving a transplant of fetal brain cells have all experienced some improvement in motor and cognitive skills.

The most severely affected patient, who had been wheelchair-bound, briefly regained the ability to walk, though his condition has since deteriorated dramatically, says Kopyov. The mental and motor skills of the two other patients, whose symptoms were much milder, continue to improve 8 to 9 months after surgery, he adds.

It remains unclear whether or how the fetal cells are helping these patients. Experience from work on Parkinson's disease suggested that patients would see no improvement for many months, a period during which fetal cells presumably grow and establish connections within the brain. Yet Kopyov's group found that the three Huntington patients began to improve within weeks of the surgery. "I don't understand it," admits Kopyov.

Another research group has also begun treating Huntington's patients with fetal cells, but this team uses porcine tissue. Five Huntington's patients have recently received fetal pig brain cells, and another seven transplants are scheduled, says Jonathan H. Dinsmore, director of cell transplantation at Diacrin, the Charlestown, Mass., biotech firm funding the trial. Dinsmore and his colleagues hope to establish that fetal brain cells from pigs offer a safe substitute in treating Parkinson's and other neurological illnesses (SN: 10/7/95, p. 230), thus avoiding the political controversy of using human fetal cells and the difficulty of obtaining tissue.

Dinsmore cautions that it will take a significant amount of time and testing to determine whether fetal brain cells, human or porcine, help people with Huntington's disease. "You need at least a year's data to know if there's anything more than a placebo effect," he says.