Deuterium in interstellar clouds raises cosmological questions

Hydrogen is the most abundant element in the universe. It is also the simplest nuclear species; its nucleus contains only one proton. Deuterium, one of the heavy isotopes of hydrogen, which has a proton and a neutron in its nucleus, is the next simplest nucleus. Deuterium is in general much rarer than hydrogen, but the exact ratio between the two is important in theories of cosmology and stellar evolution.

Determining the ratio, or the range of ratios if they happen to differ from place to place, awaited the discovery of deuterium outside the earth. That has now been done by a team from Bell Telephone Laboratories: Keith Jefferts, Arno Penzias and Robert Wilson. The result may be troublesome for cosmologists.

Deuterium is capable of replacing hydrogen in chemical compounds. When such deuterated compounds exist, the radio waves that they give off or absorb will exhibit a different spectrum from that of the same compound with hydrogen in it. The observers used the National Radio Astronomy Observatory's 36-foot reflector at Kitt Peak, Ariz., with a special receiver built at Bell Labs and especially designed for the high-frequency work that was necessary to find deuterated compounds.

The deuterium appeared in deuterated hydrocyanic acid (DCN instead of HCN) in the Orion nebula. The initial observation was made in April and confirmed by discovery of a second spectral line of DCN in October. "The surprise is that we found so much of it," the team remarks. The deuterium/hydrogen ratio on earth is about one to 6,000. The initial observations indicate that in Orion the DCN/HCN ratio is one to 500.

According to accepted astrophysical theory deuterium should be present in interstellar space in only trace amounts. The reason is that deuterium is a prime fuel for nuclear fusion processes that synthesize heavier nuclei from lighter ones. Deuterium would originally have been produced in the big-bang explosion in which the universe began. Any deuterium that condensed into stars—and that would have been nearly all of it—and any produced in stars would have been used to make heavier nuclei. Only the trace amount that had escaped condensation into stars should remain.

There are several outs open to the theorists. One is to refigure the evolution of the cosmos so as to get more deuterium produced originally. Another is to investigate the rates at which deuterated compounds are produced. If deuterium produces compounds more readily than hydrogen, the ratio of DCN to HCN may be much higher than the ratio of D to H. Astrochemists are investigating the possibility.

ture, for example, one person said, "I hear he takes off his socks while he talks." But the British analyst was not there to entertain and his low-key, trance-like delivery almost produced some trances.

In addition to being put off by the speaker's form, some in the audience were upset by the speech's mystical content. Transcendental meditation, like drug use, is advocacy of the egoless state. During meditation the meditator can lose sight of self and become one with objective reality. Or as Laing puts it, if you look at the ego long enough you see that it doesn't exist. It is a construct of the mind superimposed on the mind. Even to post-Freudians this type of talk is anathema. Many members of the audience have spent a good part of their lives attempting to rebuild or heal the egos of their patients.

In the past, each generation of psychoanalysts has produced new and diverse schools of thought and theory. And so, as a spokesman for the third generation, it is possible that Laing is only describing one more point on an arc that must continue to grow. □

Heroin highs and beyond 'Pretty in a macabre way'

The causes of death among heroin addicts are generally attributed first to overdoses, then to suicide, homicide or other trauma, then to medical complications of heroin use. At a Conference on the Medical Complications of Drug Abuse, presented by the American Medical Association last week, physicians who are into the heroin scene elaborated on some of those complications.

Ninety percent of all tetanus cases in New York City are addicts, Charles Cherubin of Metropolitan Hospital, New York City, reported. The tetanus is apparently caused by skin popping and using a quinine solution of heroin. Although there is virtually no malaria among addicts in the eastern United States because they put heroin in quinine, 50 cases of malaria have been diagnosed among addicts in California. Apparently they don't use quinine. About a third to one-half of all addicts get hepatitis from dirty needles. Fifty percent of all newborns born to addicts have hepatitits. Alcohol can complicate heroin-induced hepatitis by making the liver deteriorate three or four times faster.

"We are presently studying street heroin material," said John Sheagren of the District of Columbia General Hospital. So far he and his team have cultured 31 harmful microorganisms from the material. "Fever in addicts," he asserted, "is all that is needed to suspect deep-seated, life-threatening infection." A. I. Weidman of New York University School of Medicine and his colleagues have examined the skin of 1,000 addicts and have noted skin abscesses, ulcers, edema, hyperpigmentation. One addict, Weidman said, injected his fingers so many times they would no longer bend. Another addict ran out of veins and started injecting himself in the penis. Addicts are using not only quinine, but sucrose, baking soda, aspirin, atrophine and strychina as dilutants for heroin, Weidman pointed out. Addicts are also mixing penicillin with heroin, "which may create a new clinical syndrome," asserted J. Willis Hurst of the Emory University School of Medicine.

Contaminants from heroin, from the solution it is in or from the cotton it is filtered through can circulate through the blood and lodge in capillaries of the lung. J. E. Kasik of the University of Iowa described a polarizing photo of this event as "pretty in a macabre way." The cerebral complications that can result from heroin overdose, Ralph Richter of Harlem Hospital Center explained, include coma, seizures, deafness, stroke and brain damage. One patient, he noted, took 50 bags of heroin in one day and lost most of the vision in one of his eyes.

Some points were made at the conference that reinforce Richter's comment that "all of us are together in this fight." There were 300,000 addicts in the United States and 30,000 addicts in the Armed Forces last year: these numbers have since doubled. About $450 million is being spent annually in the United States to stop addiction. A large number of professional blood donors are addicts with hepatitis. Five to 10 percent of all hospital beds are filled with addicts. One addict ran up a bill for $250,000. Even with thousands of dollars and round-the-clock hospital care, only 30 percent of all critically ill addicts are saved. □