HC_7N a winner —
Interstellar heavyweight crowned

"Such grain clumps . . . probably include a significant mass fraction of highly complex organic, prebiotic molecules which could have led to the start and dispersal of biological activity on earth and elsewhere in the galaxy." (Nature, 17 March, 1977)

To many, a fanciful thought, challenging the theory that primordial life on earth began in its oceans, eons ago. But to its authors, Sir Fred Hoyle and Dr. Chandra Wickramasinghe, the belief that an elementary form of life might exist and even be evolving on the grains of dust in outer space, is based on their recent spectroscopic experiments.

Shortly after these ideas were proposed, an Anglo-Canadian team of spectroscopists and astronomers, using NRC's Algonquin radio telescope, detected just the sort of organic material to fan the theoreticians' flames. The name cyanohexatriyne (cyanotriacetylene), a linear compound made up of seven carbon atoms with hydrogen and nitrogen atoms tacked to opposite ends, was added to the growing list of molecules discovered in interstellar space. At the same time HC_7N, at molecular weight 99, displaced its lighter cousin cyanodiacetylene (HC_5N) as the longest and heaviest molecular species found to date.

Late last March, the new molecule was constructed for the first time in a laboratory at the University of Sussex, England, by Dr. Harry Kroto, a one-time NRC Postdoctoral Fellow, and his colleagues Colin Kirby and Dr. David Walton. Microwave measurements were quickly made on the new species and the results relayed to NRC astronomers at the Herzberg Institute of Astrophysics in Ottawa. Focussing their large radio telescope dish on a dust cloud near the constellation Taurus, the Canadian team, Mr. Norman Broten, Dr. John MacLeod, Dr. Lorne Avery and Dr. Takeshi Oka, along with Kroto, detected precisely the frequency predicted from the molecule's microwave spectrum.

Not only had the scientists crowned a new cosmic heavyweight, but their discovery also shook the foundations of some once-solid theories accounting for the formation of such molecules in space. One of the most successful, especially for simple interstellar molecules (HCO^+ for one) suggests that they build up by a sequence of so-called ion-molecule reactions between

HC_7N

The astronomers' most recent celestial target has been the so-called Cloud 2 in the constellation Taurus, an area of the sky quite different from Sagittarius B2 where HC_5N was originally found. This dark cloud, composed of dust and gas, gives off no visible radiation and yields discrete, narrow molecular lines free of the continuum emission (a wide smudge of radio frequencies) beamed out by most other sources. For the scientists, it adds up to scanning regions of space where the nature of physical-chemical change is quite different. Cloud 2, populated by fewer species of molecules and endowed with a somewhat lower excitation temperature than the turbulent Sagittarius B2, is proving to be a near-ideal source for their observations.

Le plus récent objectif choisi par les astronomes est le fameux Nuage 2 de la constellation du Taureau, qui est une région du ciel totalement différente de celle du Sagittaire B2 où HC_5N a été découvert à l'origine. Ce nuage sombre, composé de poussière et de gaz, ne laisse s'échapper aucun rayonnement visible et n'émet que des raies moléculaires discrètes et étroites, exemptes de l'émission de continuum (vaste enchevêtrement de fréquences radio) associée à la plupart des autres sources. Pour les scientifiques, cela signifie qu'ils doivent explorer les régions de l'espace où la nature des variations physico-chimiques est totalement différente. Le Nuage 2, peuplé d'un moins grand nombre de molécules de différentes catégories et où règne une température d'excitation quelque peu moins élevée que dans le turbulent Sagittaire B2, s'avère une source quasi idéale pour leurs observations.

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