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Cover: A computer which is provided with information on molecules and the forces operating between them can calculate stable configurations within a solid or liquid. The illustration by John Bianchi gives an impression of a transient state in liquid ammonia. (Story page 4.)

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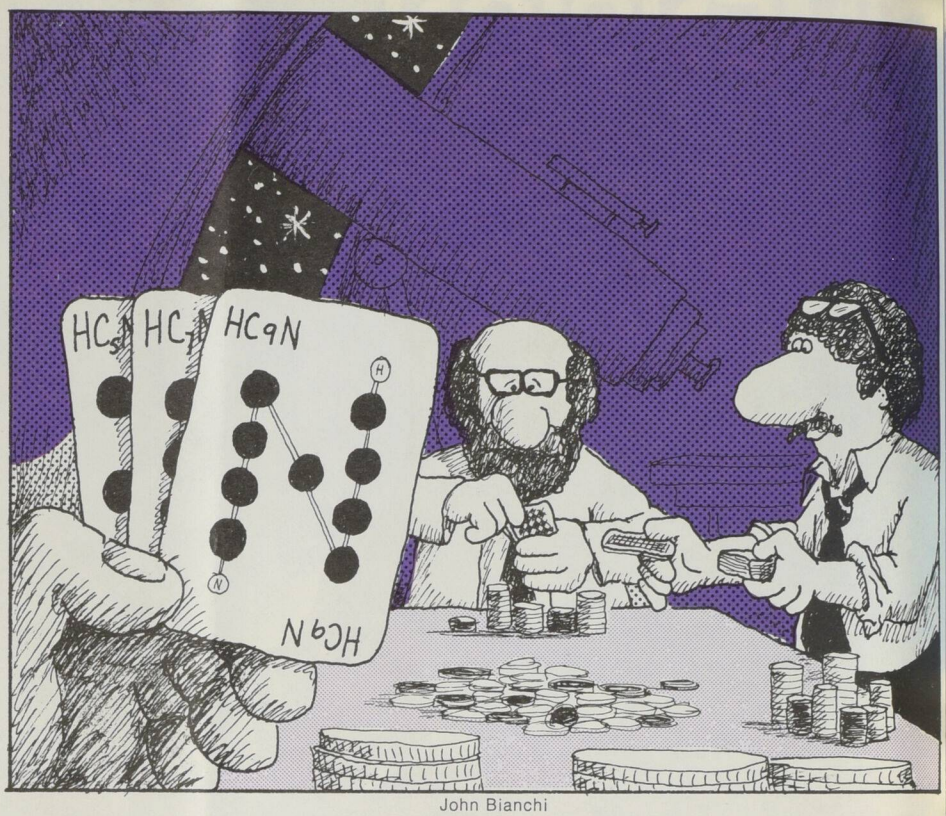
Algonquin Park – Celestial two-upmanship



John Bianchi

When we last left the Algonquin radio telescope, the ante was up to 99, molecular weight of the heaviest molecule found in space. NRC radio astronomers had just detected cyano-hexatri-yne, HC_7N, a linear structure made up of carbon, hydrogen and nitrogen. But that was months ago and not all of the cards had been dealt. Today the stakes are higher and Norman Broten's observing team holds another winning hand.

Their latest discovery is cyano-octatetra-yne, HC_9N, two carbons longer at molecular weight 123 (and about three times less abundant in space than the seven-carbon molecule). Unlike the previous searches for HC_5N and HC_7N, however, this time scientists lacked the benefit of precise measurements on lab-made molecules to point the way (cyano-octatetra-yne, in fact has never been made on earth). Instead, with data provided for the earlier discoveries by Dr. Harry Kroto, a colleague at the University of Sussex, England, Ottawa spectroscopist Dr. Takeshi Oka managed to extrapolate a target frequency for HC_9N. Shortly afterwards, a molecular line at the predicted value was detected by Dr. Lorne Avery using NRC's radio telescope in Algonquin Park. A second, related line confirming the discovery was then found by Dr. John MacLeod of NRC, observing at the National Radio Astronomy Observatory (NRAO) in Green Bank, West Virginia. The sightings were made in a particular narrow "ridge" of Heiles Cloud 2, some 350 light years away in the constellation Taurus, the same region where both HC_5N and HC_7N had been discovered previously.

The fact that HC_9N is linear in nature (like a taut string of 11 beads) with a relatively simple spectrum made it more easily detectable by the frequency pattern of the energy given off. This energy is released as the long molecule rotates rapidly in space, much like a whirling baton thrown into the air. Since HC_9N has the property of dipole moment (an uneven distribution of charge) it behaves like an oscillating electromagnetic field, beaming out microwave radiation as it turns.

The increasing size of these molecules has now taken observers beyond the molecular weight of the smaller amino acids, raising the tantalizing possibility that these species, part of the trump suit of life, may eventually be found as well. Although the odds may be against such a cosmic jackpot in the near future, NRC astronomers won't bet against soon adding more heavy molecules (perhaps $HC_{11}N$) to their own long suit. □

Wally Cherwinski