

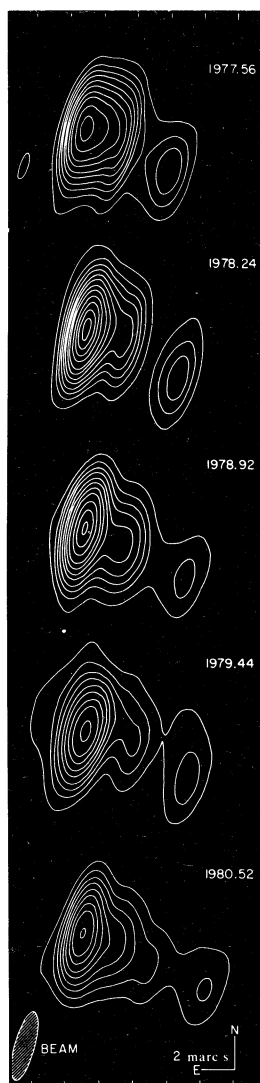
Expansion at 9.6 c: Unambiguous claim

The radioastronomical technique of very long baseline interferometry (VLBI) has contributed a number of surprises. The technique consists of combining signals received from a given astronomical object at the same moment by several widely separated radiotelescopes. Proper processing of the differences among these signals, mainly the phase differences, will bring out fine details of the object's structure that a single telescope could never distinguish. One of the early surprises—it came about a decade ago—was the discovery that a few quasars seemed to be separated into two or three blobs that were separating from each other at speeds greater than that of light.

Such motions are, of course, forbidden by the most basic laws of modern physics. There are some astronomers who like to see astronomy drop bombs on physics, and they retired to meditate and speculate on what a universe with superluminal motions would be like. Most astronomers hastened to try to find interpretations of the data that would either explain away the superluminal motion or reduce it in fact to a more tolerable less-than-light speed. Discussion and observation have simmered on for years without any generally accepted conclusions. Now comes a group of observers from the Owens Valley Radio Observatory of California Institute of Technology to publish in the April 2 *NATURE* what they call "the first direct and unambiguous evidence of superluminal expansion in any radio source." They are T. J. Pearson, S. C. Unwin, M. H. Cohen, R. P. Linfield, A. C. S. Readhead, G. A. Seilstad, R. S. Simon and R. C. Walker. The source they observed is the curious quasar 3C273.

One might ask: Was there no unambiguous evidence before now? There was evidence, but it was susceptible of various interpretations. In the past VLBI sampled the object of observation along a one-dimensional line corresponding to the baseline joining the telescopes on earth. In such a situation a single irregularly shaped piece of the object could look like several as the line cut across extrusions or fingers and the spaces between them. One of the classes of theory that grew up proposed that there was no real motion. There were many more than two or three blobs along the line, and they flashed in sequence like the chase lights of a theater marquee or certain Christmas trees, giving the illusion of motion. The illusion could go at any speed at all; nothing physical was moving.

What the Caltech group have done is to make maps, or more properly "hybrid maps," of 3C273 using antennas in California, Texas, West Virginia, Massachusetts and occasionally West Germany. They have taken advantage of new devel-



Hybrid maps of 3C273 show a bright eastern core and a smaller western extension. The two clearly separate over the period 1977 to 1980. Calculation of the apparent velocity gives 9.6 times the speed of light.

Pearson et al./Nature

opments in VLBI techniques that permit the extraction of some two-dimensional information from the addition and subtraction of the signals received at the different telescopes. A hybrid map does not contain as much two-dimensional information as a true intensively surveyed map, but there is enough to draw radio-brightness contour maps of 3C273. They show that there are two components and that they are separating with an apparent velocity of 9.6 times the speed of light.

This, if accurate, would throw into the trash dumper the Christmas-tree models and other nonmotional explanations. There is another school of explanation that accepts the existence of motion but tries to get the true motion below the speed of light by manipulating the geometry. Suppose 3C273 is periodically throwing out blobs of matter at a very narrow angle to our line of sight. That means that we get a highly foreshortened view of the motion, and it looks much faster than it really is. For this apparent velocity of 9.6c the angle between the line of sight and the jet of emitted blobs comes to 11.9°. This is so narrow that the probability of its being true for a random quasar is about one percent. There are a number of

other problems of relating this seeming uniqueness of 3C273 (having its emission jet turned almost exactly to the earth) to the astrophysics and statistics of other quasars.

New theories may be necessary. Few astronomers like to imagine a world in which things go faster than light, but as Guy Pooley of the Mullard Radio Astronomy Observatory of Cambridge University puts it in the same issue of *NATURE*, "Astronomers... are used to the impossible and, since then [the first reports of superluminal behavior], there have been advances in both theory and observations." Such advances often make the impossible commonplace. □

Contraceptive foams and birth defects

Spermicidal foams, jellies and creams are supposed to prevent pregnancy, but there are instances in which women using these contraceptives do get pregnant. And when this happens, the unsuspecting woman may continue to use the spermicides after she has conceived. Now there is epidemiological evidence that contraceptive foams, jellies and creams cause birth defects if used at or around the time of conception, report Hershel Jick of Boston University Medical Center and his colleagues in the April 3 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*.

The researchers studied 790 women who belonged to a prepaid medical practice group in Seattle and who had filled prescriptions for contraceptive foams, jellies or creams within 600 days prior to delivery or miscarriage of their offspring. They then compared the women with others of comparable age who had not filled prescriptions for foams, jellies or creams within the previous 600 days. (The researchers could not be certain, however, that the women who had filled the prescriptions had actually used them around or after the time of conception.)

The frequency of birth defects among the women who had filled the prescriptions was 2.2 percent versus 1.0 percent for those who had not, and the rate of miscarriages among the former was 3.5 percent versus 2.0 percent for the latter, suggesting that foams, jellies and creams might cause birth defects or miscarriages. Down's syndrome, limb malformations, cancer and severe defects in the architecture of the penis or urethra were the birth defects seen most often.

If contraceptive foams, jellies and creams are capable of causing birth defects, the investigators say, they might do so by several routes—by acting on sperm, since they are designed to damage sperm; by being absorbed into a woman's bloodstream and damaging her egg before it is fertilized, or by acting directly on an embryo after it is conceived. □