How radio galaxies got their fluxes

Some leopards have spots. Some leopards are solid black (and misnamed panthers). Some galaxies are strong radio sources. Other galaxies can't be detected in radio. How do leopards get their spots? How do galaxies get their radio generators? This is a Just-So story (and it's a gasser). For leopards the answer is certainly: genetics. For galaxies the answer appears to be: environment.

Such is the conclusion being drawn — about galaxies, not leopards — after a survey of spatially isolated galaxies by astronomers Mark T. Adams of the University of Arizona, Eric B. Jensen of Rice University in Houston and John T. Stocke of the University of California at Los Angeles. This group made a survey of a sample of isolated galaxies picked out of the catalogue drawn up by the late Fritz Zwicky.

Isolation was defined as being at least 20 galaxy diameters away from any other galaxy that had a diameter between four times larger than and four times smaller than the galaxy being defined. Most galaxies tend to live in clusters and are much closer together than this. These isolates amount to about three percent of all galaxies, but their isolation, as defined here, means that they probably have not had a close encounter or interaction with another galaxy for at least four billion years.

The sample chosen included 120 elliptical (and class S0) galaxies and 440 spirals. The 300-foot radiotelescope at the National Radio Astronomy Observatory was used to search for spectrally continuous radio emanations from them. None of the sample turn out to be strong radio sources. Only one elliptical was detected at all, where ten might have been expected. A similar ten-to-one deficiency was found for the spirals. Details of the survey appear in the August ASTRONOMICAL JOURNAL.

The observers were expecting this sort of result. It has long been known that the strongest radio sources among galaxies tend to be in large and dense clusters. Taking all this together leads to a theory of what makes a strong radio galaxy, namely infalling gas. The physical mechanism by which infalling gas could produce a radio generator, given the existence of magnetic fields, which most galaxies have, is easy to hypothesize (a little friction or radiation to ionize some of the gas, some twisting around the magnetic field, and the whole thing can get going). The question here is where the gas comes from.

One possible instance is during a close encounter with another galaxy, in which gas might be exchanged from one to another. A second possibility is an internal gas generator. The product of this would be held in by the pressure of the intergalactic medium and the gravitational forces generated by the presence of the cluster. An isolated galaxy would not have encounters, and it would not have high-pressure surroundings to prevent its own native gas from flowing off in a kind of galactic wind.

The above scenarios for the production of radio sources and the origin of the infalling gas are not mutually exclusive. In some cases they could be different ways of looking at the same process. Further work is underway. □

Warning: Alcohol may be bad for your brain

Long-term alcohol use, even without the malnutrition that often accompanies it, is capable of destroying brain cells, says a recent study. Long-term alcohol use destroys the neurotransmitter that helps fight anxiety and thus encourages alcoholics to drink more and more to quell their anxiety, says another study. Both are reported in the Aug. 8 SCIENCE.

Numerous types of brain damage have been observed both in chronic alcoholics and in experimental animals exposed to alcohol over long periods of time, but it has not been known how much of this damage is due to alcohol and how much to malnutrition. Don W. Walker and his colleagues at the Veterans Administration Medical Center and the University of Florida College of Medicine in Gainesville now have evidence that heavy alcohol use alone (at least in rats) can destroy neurons.

Thirty rats of the same age were divided into three groups. One group was allowed unrestricted access to alcohol and an otherwise nutritionally adequate liquid diet. The second group was given an identical diet except that sucrose was substituted for the alcohol. The third group was given unlimited access to standard rat chow and water. After 5 months of the liquid diet and another 2 months of standard diet the brains of the animals were analyzed.

Walker and his colleagues found a significant loss of neurons — about 18 percent — in the brains of the rats given alcohol, compared with rats in the other two groups. "This study," they conclude, "provides direct evidence that long-term ethanol consumption, in the absence of malnutrition, produces neuronal loss in the central nervous system."

Valium and related tranquilizers produce their antianxiety effects via the neurotransmitter gamma-aminobutyric acid (GABA) (SN: 11/17/79, p. 345). J. N. Nestoros of McGill University in Montreal reports that alcohol also counters anxiety by increasing the effects of that same neurotransmitter. In studies of anesthetized cat brains he found that alcohol enhances the action of GABA but not that of three other neurotransmitters. This finding, he believes, has practical implications for alcoholics. One of the reasons alcoholics turn to alcohol in the first place, researchers have found, is that they are anxious, and alcohol relieves their anxiety. Now Nestoros's research suggests that alcohol relieves anxiety by acting on GABA in their brains. Other findings, however, have shown that long-term alcohol use, in contrast to short-term use, decreases the amount of GABA in the brain. It is thus conceivable, Nestoros concludes, that as time goes by alcoholics "are forced to use higher amounts of ethanol in order to obtain GABA potentiation necessary to achieve an antianxiety effect. . . ." □

Viral genes in human tumor DNA

Three papers, all in a row in the July 13 NATURE, present evidence that strengthens the link between liver cancer and human hepatitis. A similar report, by a fourth independent group, beat the crowd and appeared in the February JOURNAL OF VIROLOGY. The work, although differing in details, all points to the same conclusion. The genetic material of the hepatitis B virus can be found inserted directly into the human genetic material, the chromosomes, of liver cancer cells.

In animals it is clear that certain viruses can transform normal cells into cancerous ones. The viruses usually subvert the healthy cell by inserting their viral genes into the animal chromosome. Until now only one such integration of viral DNA into human tumor DNA had been observed: Epstein-Barr virus genes can be found in the chromosomes of tumor cells from Burkitt's lymphoma (SN: 9/9/78, p. 180).

In the four recent reports on hepatitis B virus, the tumor cells examined were laboratory-grown descendants of a 1975 liver tumor from a Mozambican man with a persistent hepatitis B infection. Those cells, called Alexander cells or PLC/PRF/5, produce a viral protein that, in a hepatitis B virus, is located in the outer coat. The investigators found evidence that several copies of viral DNA are inserted at specific sites in the DNA of those human tumor cells. The groups disagree somewhat on the number of copies. Patricia L. Marion and co-workers at Stanford University and in South Africa, who published the first report, say the cells contain approximately four copies of the viral genes per copy of human DNA. Jeffrey C. Edman, William J. Rutter and colleagues at the University of California at San Francisco find evidence for at least six insertion sites in a copy of human DNA.

Tissue from other cancerous and normal livers has been examined by Christian