BIOLOGY

Julie Ann Miller reports from Cornell University at a meeting called "Physiology: The Next Decade"

Another protein in cancer biochemistry

Among the properties that distinguish tumor cells from their normal counterparts are reduced requirements for growth. For example, normal cells need calcium in order to proliferate, but tumor cells do not. A permanently elevated pool of calmodulin, the protein considered responsible for a cell's sensitivity to calcium (SN: 8/23/80, p. 119), appears to be at least part of the explanation. Scientists have measured a 2- to 4-fold increase in the calmodulin content of cells as they become cancerous.

A different calcium-binding protein, described by John P. MacManus, seems to occur only in tumor cells. In work with James F. Whitfield at the National Research Council of Canada in Ottawa, MacManus has detected the protein, which he calls "oncomodulin," in rat, mouse and human tumor cells of many tissues. He has found the small protein both in tumors arising spontaneously and in those induced by chemicals and viruses. It has not been detected in any normal tissues, so it may be of diagnostic use. MacManus reports that oncomodulin is not a fragment of calmodulin, although they both stimulate certain enzymes and DNA synthesis. The presence of oncomodulin and increased calmodulin could account for the characteristic independence of tumor cells from the calcium requirement. In the interest of developing diagnostic tools, MacManus has used antibody to oncomodulin to label cells from a biopsy of a human brain tumor. MacManus is eager for other laboratories to confirm the oncomodulin findings, because no protein found previously is specific for tumor cells.

Rats report angel dust experiences

The detection of brain receptors for chemicals not found naturally in the body is generally met with some skepticism, especially when the chemical is a drug of strong popular interest. Candace Pert of the National Institutes of Health now describes a combination of chemical and animal experiments that strongly support the existence of the receptor recently reported for PCP (or angel dust), a drug used first as an anesthetic and now used illegally as a mind-altering drug (SN: 10/27/79, p. 276). Rats were trained to indicate when they were in the "angel-dust state" by being rewarded for pressing one lever after receiving an effective dose of the drug and for pressing another lever after receiving a placebo. Then, using a set of chemical analogs of PCP, the scientists determined the lowest dose of each analog that produced the altered state recognizable to the trained rats as the PCP experience. An analog's relative effectiveness so determined correlates with the strength with which it binds to the putative receptor in laboratory tests. Pert views this correlation as strong evidence linking the receptors under study and the psychological state.

Anchoring the synapse

Subunit by subunit the receptor molecules of the nerve-muscle synapses are being analyzed. Jean-Pierre Changeux of the Pasteur Institute in Paris describes the structure of the receptor as it has been determined from a particularly abundant source of synaptic material, the electric organ of the torpedo or electric ray. The receptor has five subunits, two of which are identical, which extend across the post-synaptic membrane. Similarities in the amino acid sequences suggest the subunits have a common ancestral gene. A recent discovery is an associated protein, known only as 43 K, that resides entirely on the cell-side of the membrane. Changeux speculates the role of the protein is to stabilize the receptors in the lipid membrane, localizing them under the nerve ending. He predicts, "This work opens a new field — the genesis of the synapse in molecular terms."

ASTRONOMY

Dietrick E. Thomsen reports from Seattle at the meeting of the Astronomical Society of the Pacific

The strange case of the moving nebula

Bruce Balick of the University of Washington in Seattle was billed on the program to talk about the lobes of the galaxy 3C305. At the last minute, in the fashion of Doctor Watson, he changed his presentation to a discussion of the strange appearances in the thing called Markarian 335. This object is cataloged as a type I Seyfert "galaxy," but we put "galaxy" in quotes because earlier observations had not shown an extended galaxy around the bright compact object, which looks like a very energetic galactic center, or as Balick put it "a quasi-quasar."

Balick's very recent observations with Tim Heckman of the Steward Observatory of the University of Arizona in Tucson have found something, not a galaxy exactly, but a number of nebulosities. The blobs seem to prefer the southeast quadrant of a circle centered on the bright central object; only one of them was found in the northwest.

The biggest blob shows emission lines in its spectrum. Whatever that may mean to the physics going on in the blob, it means that observers can compare the observed wavelengths of well-known lines with the same wavelengths determined at rest in the laboratory to calculate the Doppler shift and so compute the speed at which the blob is moving away from us. If the blob is really associated with Markarian 335, it should be moving with that object and so have the same redshift as that object. Markarian 335's redshift was already known.

The redshift of the biggest blob was checked with filters. A series of filters was prepared, each of them designed to pass the light of the alpha line of hydrogen (which the blob emits) if the lines happen to be shifted to the red a certain amount. The wavelengths that the filters passed ranged from slightly below the known redshift of Markarian 335 to slightly above it. Starting with pictures taken through the low-redshift filters and going to higher ones, the image of the big blob was brightest at the redshift of the central object, indicating that that redshift is the best mean redshift for the blob. (The existence of turbulence in such a nebula is usual. Accordingly, the cloud would exhibit a slight spread of redshifts corresponding to the different relative velocities of the individual atoms that emit the light.)

This is where the really curious thing happened. Between the low-redshift pictures and the one at the redshift of Markarian 335, the blob changed its position, swinging north. "There may be a cosmic conspiracy to give the appearance of a moving nebula," says Balick, but he and Heckman don't think so. They hastened to check the video imaging system they were using to see whether it made ghost images, but in calibrating the video system on bright stars in the vicinity of Markarian 335 they found no evidence that it did.

Why this nebula should move in this way and exactly how it is related to the central object of Markarian 335 is not known, but from the appearance of its spectrum some things can be told about it: Temperatures inside it seem to range between 5,000 and 50,000 kelvins, and there are velocities inside it up to 3,000 kilometers a second. If it has a density of 100 atoms per cubic centimeter, its binding energy comes to 10^{56} ergs. That is large but not unbelievable: The binding energy of an average elliptical galaxy is about 10^{59} ergs, or 1,000 times as much.

Of the smaller blobs, much less is known. Balick suggests that observers try to obtain spectra for them. They are very small and dim, and so that will be a difficult undertaking.

Balick also points out that this case may have a wider significance. Astrophysicists now tend to see quasars, Seyferts and ordinary galactic nuclei as forming a continuum of related types. If similar nebular blobs are associated with quasars or other Seyferts, they may throw some light on the astrophysics of those objects and their relations to ordinary galaxies. Or they may confuse a murky situation even further.

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