behavioral sciences

Cross-eyed cats

Many Siamese cats are cross-eyed or have a nystagmus (rapid involuntary movement of the eyeballs). Siamese cats also carry a gene of the type that produces albinism. Last week in Houston at the second annual meeting of the Society for Neuroscience R. W. Guillery of the University of Wisconsin said the albino gene produces a misconnection of the nerve fibers that link the eye to the brain. Nerve fibers that pass from the retina to the brain are misrouted to the opposite hemisphere, not to the same side, as is normal. Thus the Siamese cat's brain receives a picture of the outside world that is a mirror-image of the normal. The brain must either suppress or rearrange this input.

"This pattern has now been found in six different mammalian species," reported Guillery, "and it is necessary to conclude that the albino gene itself plays a key role in producing this abnormality." Because human albinos commonly have the same visual defects, Guillery says it seems probable they have similarly misrouted pathways.

Learning in the embryo

As soon as a duckling (*Anas platyrhynchos*) is hatched, it is able to recognize and respond to its mother's assembly call. It does not respond to similar calls of other species. Gilbert Gottlieb and Marieta B. Heaton of the Department of Mental Health in Raleigh, N. C., have found that this discriminative ability is learned by the duck in the embryonic state. As early as five days before hatching, they say, the embryo will make physical responses to the low-frequency portion of the maternal call. Several days later, after respiration has started and the embryo itself is capable of vocalization, its response broadens to include the high-frequency components of the mother's call. These vocal responses (by the embryo and its siblings) were found to be important stimuli in teaching the young duck to respond to its mother. Removing an egg from exposure to self or sibling vocalizations led to imperfections in the selectivity of the hatchling's response to assembly call.

Regeneration of nerves

It has generally been concluded that the central nervous system (CNS) is capable of little or no regeneration in response to injury. This view is not correct and should be substantially modified, says Robert Y. Moore of the University of Chicago. Recent histochemical evidence, he says, has shown that one group of neurons in the mammalian CNS, those producing monoamines as neurotransmitters, have a significant capacity for exhibiting growth and plasticity in the adult brain and spinal cord.

Two types of response to injury were demonstrated in these neurons. Cut axons were found to vigorously sprout new axons that would enter and supply nerves to structures in the brain (or surrounding tissue) not previously innervated by this group of axons. And, in areas where innervation had been removed, the monoamine-producing axons appeared to sprout and re-innervate the vacated synaptic sites. This response to injury occurs in some areas of the CNS but not others. "The tasks remaining," says Moore, "are to demonstrate the generality of these phenomena in the mammalian CNS and their functional significance."

physical sciences

An X-ray amplifier

One of the necessary steps toward an X-ray laser is the development of a way to amplify X-rays by stimulated emission. A way of producing apparently coherent emission in the hard X-ray part of the spectrum was reported recently (SN: 8/19/72, p. 116).

In the Oct. 9 PHYSICAL REVIEW LETTERS, R. A. McCorkle of East Carolina University in Greenville, N.C., reports a method for stimulating and amplifying X-rays in somewhat softer parts of the spectrum. The device would use a beam of accelerated heavy ions and a thin foil. By proper use of a pulsed electric field, the ion beam is made to strike the foil in a spot that sweeps along the length of the foil at a speed near that of light. As the ions strike the atoms of the foil a population inversion (more excited states than unexcited) appears among the inner electrons of either the ions, the atoms or both. An X-ray emission that starts as a result of decay of the excited states at the point where the bombardment begins could be coherently amplified as it passed down the length of the foil and encountered the inverted populations left by the ion beam. Proper combinations of elements in the ion beam and the foil could produce different wavelengths.

Hard magnetic bubbles

Magnetic bubbles are small cylindrical domains within a piece of magnetized matter in which the magnetization is opposite to that of the bulk of the material. The domains can be made to move by application of a driving field (SN: 5/8/71, p. 318).

Recently a new form of magnetic bubble, called a hard bubble, has been discovered. The hard bubbles are more stable than the previously known "normal" bubbles and have different dynamic properties. Instead of moving only parallel to the drive field, the hard bubbles have a velocity component perpendicular to the field and would in general move at some angle to it.

Two papers in the Oct. 2 PHYSICAL REVIEW LETTERS present explanations of static and dynamic properties of the hard bubbles. The authors are A. Rozencwaig, T. J. Nelson, W. J. Tabor and G. P. Vella-Coleiro, all of Bell Telephone Laboratories in Murray Hill, N.J.

The explanation of both static and dynamic properties depends on the nature of the walls of the bubbles, narrow regions in which the direction of the magnetism gradually turns over. The difference between hard and normal bubbles seems to rest on the way the direction of the atomic spins (and hence the magnetism they generate) rotates in the walls.

A nonexplanation of lunar magnetism

Rocks brought from the moon show a remanent magnetism, a magnatism imposed by an external field perhaps aeons ago and frozen into the rocks. Observers have concluded from this that the moon may have possessed a magnetic field at one time, and the suggestion has been made that it was produced by an internal dynamo like the earth's (SN: 5/27/72, p. 346).

In the Oct. 6 SCIENCE Eugene H. Levy of the University of Maryland presents arguments against the dynamo. The major contention is that to produce a field of the proper strength, the moon would have had to rotate so fast that it would have broken up.