Twirling magnets and tumor growth

A rotating magnetic field appears to retard significantly the growth of a type of mouse tumor that contains the mineral magnetite (Fe_3O_4). Frank L. Tabrah and Stanley Batkin of the University of Hawaii and Joseph L. Kirschvink of the California Institute of Technology discovered magnetite particles, about one-tenth of a micron in size, in two kinds of mouse tumor, but none in normal mouse tissue or in human cancer cells.

The scientists worked with YC-8 lymphoma and Lewis lung mouse tumor cells. The YC-8 cells grew faster when exposed to a 2,000-hertz oscillating magnetic field and slower when exposed to a 60-hertz rotating field produced by a spinning magnet. The Lewis lung tumor cells showed no response. The two strains of tumor cells seem to have magnetite particles of different size and shape.

Kirschvink says very little is understood about the precise location and function of the particles. The rotating magnetic field may damage the cells mechanically by twirling the particles or electrically by inducing harmful currents. Much further research is necessary before possible uses of this phenomenon in cancer treatment can be considered, he says.

Complex math for a complex brain

Two brief tasks, differing only in the type of mental judgment required, set up different brain patterns of electrical activity. But it takes an array of more than two dozen recording electrodes placed on the subject's scalp and an advanced mathematical pattern-recognition computer program to distinguish them. Alan Gevins of the Langley Porter Psychiatric Institute at the University of California at San Francisco reports that the tasks, which require either spatial or numerical judgment, do not simply involve either the left side or the right side of the brain. He says each task produces a complex, rapidly changing pattern of electrical activity in many areas in the front and back of both sides of the brain. Simple analyses of data, maps of electrical activity determined at 175-millisecond intervals, do not reveal distinctive brain patterns for the two tasks, but Gevins applies a pattern-recognition computer program that fits signals with complex polynomials instead of with normal curves. He can then distinguish the patterns of the spatial and numerical judgment tasks. Gevins says, "This is a new methodology, and we need to replicate it. If it holds up, it can provide another window on the normal, functioning brain."

Insect sex: What's the foreplay for?

Elaborate, close-range interactions are a necessary, and often puzzling, overture to copulation in many insect species. "Why waste time dallying with foreplay?" Thomas Eisner of Cornell University asks. "What it is that the sexes 'say' to one another in that context, and why they should even need to communicate once they have achieved the proximity necessary for copulation, is often a mystery." From his observations of butterflies, moths, beetles and grasshoppers, he suggests one solution — that during such dalliance, the female insect may be evaluating her suitor's chemical arsenal.

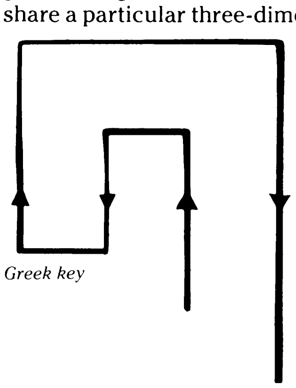
The effective defense of a variety of insects relies on chemicals that are toxic, or at least terrible tasting, to potential predators. The chemicals are derived from ingested plant alkaloids. Eisner reports that during courtship the male moth *Utetheisa ornatrix* applies a secretion containing its defensive pheromone to sensory structures of the female. Similarly, a courting grasshopper emits a froth that contains many chemicals, some of which may be deterrent to predators.

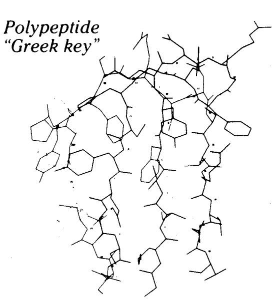
In addition to preserving a species' defensive endowment for future generations, the female insect's evaluation may ensure the safety of her own offspring. Eggs of danaid butterflies contain a protective alkaloid, and Eisner finds that some of the alkaloid is contributed by the father. Among the beetles known as Spanish-fly, Eisner has also observed that a chemical deterrent to prey is transferred during copulation from the male to the female, and it ends up in the eggs. He concludes, "There is no end to the types of subtle interaction that take place in courtship."

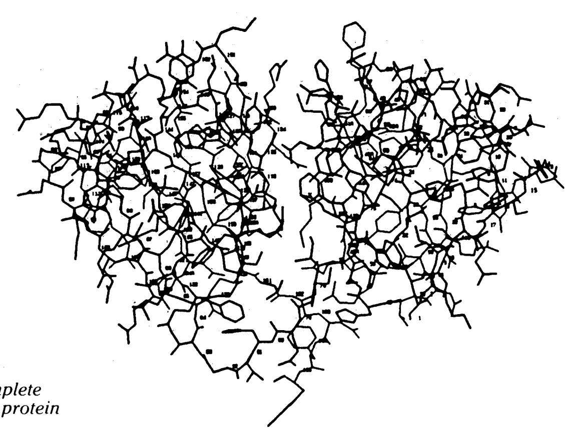
Eye-to-eye with a lens protein

The first X-ray analysis of an eye lens protein reveals the highest internal symmetry of any protein so far studied by that technique. The symmetry may be responsible for the remarkable stability of lens material, which must remain functional throughout life, suggests Thomas L. Blundell of the University of London. Blundell and colleagues have described the structure of a protein from bovine lens called γ-crystallin II. γ-crystallin is the smallest and most homologous of the lens-specific proteins, which are crucial to the transparency and refractive power of the normal lens.

Blundell reports that the γ-crystallin protein contains two globular regions connected by a polypeptide chain. The regions share a particular three-dimensional structure. The polypeptide chain is folded with a series of bends, which the investigators call a "Greek key" motif. The configuration resembles a common border design on ancient Greek pottery. Blundell says that each of γ-crystallin's domains comprises "a sandwich of two four-stranded sheets, each sheet being made from three strands of one 'Greek key' motif and one strand from another." Because one of the two larger common lens crystallin proteins shares a significant amount of sequence with γ-crystallin, Blundell suggests that it has a similar three-dimensional structure, with the addition of flexible extended arms at both ends. In both cases the tight, intricate three-dimensional structure may protect the proteins from outside interactions.


Greek key


Polypeptide "Greek key"


Complete lens protein