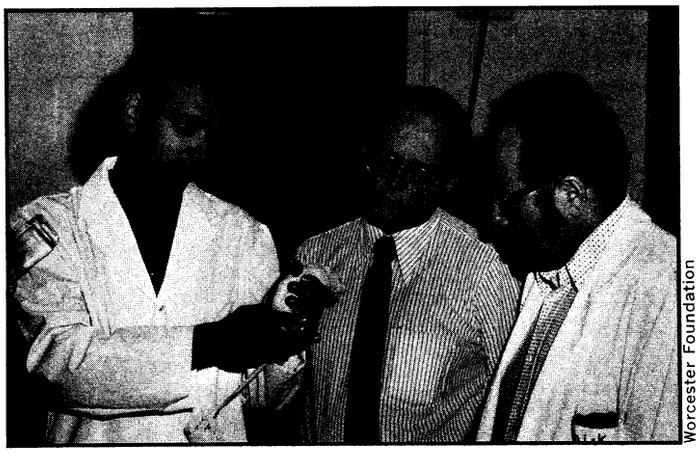


Worcester Foundation

Stern, Morgane and Resnick: Rodent studies demonstrate harmful effects of protein deprivation on the fetus and newborn.

slowest around the 13th day after birth, and then slowly returned to normal as the pups matured. Even though the responses returned to normal with maturity, the investigators believe the sluggish early responses to stimuli probably interfered with the animals' normal growth and development.

As for the behavioral effects of early protein deprivation, the Worcester scientists found that it enhanced the newborn rats' susceptiblity to seizure. They also found that the brains of these animals contained abnormally high levels of the nerve transmitter serotonin. This finding surprised them because past research has shown a strong link between seizures and low levels of serotonin. So they believe that serotonin cannot be a major determinant in seizures. They also found that these seizures could only be partly reversed by giving the rats adequate protein diets once they became adults. Thus, such damage appears to be irreparable.

The Worcester team has also shown that development of nerve cells in the cerebellum and hippocampus was retarded in the protein-deprived rats. The cerebellum is the area of the brain that controls movement; the hippocampus is the seat of memory.

These and past findings about the effects of early protein deprivation have practical implications for Americans, Morgane told SCIENCE NEWS. It appears that a mother need only be deprived of adequate protein right before and during pregnancy to harm the fetus she carries. And whereas the first 15 days of life are especially crucial for the rat's brain development, the last three months of pregnancy and the first year of life are crucial for humans' brain development. And many, if not all, of the harmful effects wrought during this period leave their marks for life.

It's quite possible—although exceedingly hard to prove—that many American children have learning and behavioral problems because they were deprived of necessary amounts of protein during fetal and neonatal life. □

Now you see it; Now you don't

Most people are familiar with the phenomenon of afterimages. If a person stares into the sun or at an intense light for any period of time, an afterimage will linger even though he or she may be looking away from the light source. Past research has shown that these images are not produced in the brain but originate in the eye itself.

Now two molecular scientists, Donald I. A. MacLeod and Mary Hayhoe, while working at Florida State University, have further pinpointed the site of afterimage production to be in the rods of the eye. Their findings are reported in the Sept. 27 SCIENCE.

When a person gazes at an object, the image is focused on the retina, somewhat like a newspaper photograph, as a series of points. The retina is made up of layers of rod and cone cells and each point of the image received corresponds to a rod or cone. Cones are best adapted for daylight, sharp stationary images and for color vision. The rods enable vision in dim light and are not color discriminative. When exposed to intense light, the cones take about five minutes to recover their sensitivity while rods take longer.

Prolonged afterimages occur when the visual pigments of the eye are bleached. The manner in which the afterimage appears depends upon the background it is viewed against. When the background is dark or the eyes are shut, the afterimage appears dimly against the dark background and is called the positive afterimage. When viewed against a bright background it appears dark and is called the negative afterimage. Afterimages against any unchanging background will fade within a few seconds. Generally a sudden change in background intensity will cause the afterimage to reappear.

MacLeod and Hayhoe found, however, that under some conditions a change in background will fail to revive the afterimage. In a series of experiments, they had an observer stare into a white light for 30 seconds. They found that for the first few minutes afterward, while the cones and rods remained insensitive, any change in background could revive the afterimage. But after seven or eight minutes, when the cones have recovered their sensitivity, the observer was able to locate a range of background intensities that failed to restore the afterimage. Above that range a negative afterimage would appear; below that range a positive image would appear.

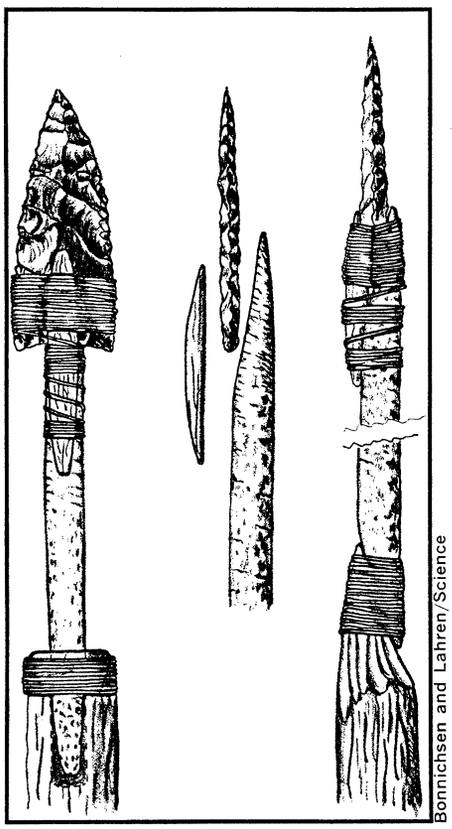
In a second series of experiments, three totally colorblind persons (rod monochromats—persons for whom lights of different wavelengths appear identical to the rods) were asked to substitute background lights that are for them undistinguishable from the "condition" background. According to the researchers, the average radiances the rod monochromats chose were close to those chosen by the normal observers as having no effect on the afterimages. Thus only those backgrounds that are indistinguishable by rods (but very different for the cones) may be interchanged without reviving the afterimage. From this, MacLeod and Hayhoe deduce that the afterimages must be generated by the rods alone.

"During the first phase of recovery," MacLeod and Hayhoe conclude, "both rods and cones are locally insensitive and can generate afterimages. After seven minutes, the cones have recovered to the same fully dark-adapted sensitivity in the bleached area as in the rest of the retina. Being uniformly sensitive and uniformly stimulated, the cones cannot now create an afterimage, for they cannot signal a distinction between bleached and unbleached areas. Only the rods can now revive the afterimage, and they cannot revive it unless they detect the change of background." □

Early weapons to slay the mammoth

About 11,000 years ago in what is now the western United States, perhaps the first primitive North American hunters survived by hunting the fearsome mammoth. This extinct elephant had huge spiraling tusks often 10 feet long, and stood more than 12 feet high at the shoulder. It has always been difficult to understand how primitive men were able to down such giant prey.

Archaeologists Larry Lahren of the University of Calgary at Alberta and Robson Bonnichsen of the University of Maine at Orono report in the Oct. 11 SCIENCE the discovery of bone foreshafts in a burial site near Wilsal, Mont., and put forth a theory that



Bonnichsen and Lahren/Science

Early hunters' disposable lance points.

helps explain the mystery. They found beveled and cross-hatched pieces of bone along with the fluted projectile points that have become the mark of the Clovis hunters. (The primitive hunters are named after an archaeological dig near Clovis, N.M.)

Lahren and Bonnichsen made wooden replicas of the bone foreshafts in an attempt to understand their function. They lashed the two beveled pieces to a projectile point and a wooden lance (see diagram) and found that the foreshafts gave stability to the weapons. The two bone pieces "act like a pliers grasping the projectile point," Bonnichsen says, and prevent slippage. The weapon's narrow, resilient neck also would allow for deeper penetration into the mammoth's body than if it had a point attached directly to a thick lance, he says.

With this weapon model in mind, they propose that the early hunters could have carried many foreshaft-point units and just a few lances to the hunt. After stabbing a mammoth, a hunter could have pulled out the lance and left the detachable point unit buried deep within the wound. Then, within seconds, he could have replaced the unit and stabbed again. If the Clovis hunters had been aware of and aimed for the vulnerable nerve centers that may have existed in mammoths (and do exist in modern elephants) with their versatile weapons, they could, Lahren and Bonnichsen believe, have successfully slain their giant prey. □

Opening of the far northern seas

One of the best known and most widely accepted reconstructions from the ancient days of the supercontinents is the rending and gradual separation of Africa and South America, whose facing coastlines still fit like adjacent pieces in a global picture puzzle. Somewhat less obvious to the casual glance is the northern continuation of that great schism, when North America and Eurasia moved apart to form what is now the North Atlantic Ocean.

The research vessel Glomar Challenger has devoted Leg 38 of its deep-drilling mission to the final rifting in this northern split, the breakup of Norway and Greenland that produced the Norwegian and Greenland Seas as well as the mini-continent of Iceland. Led by Manik Talwani, director of Columbia University's Lamont-Doherty Geological Observatory, and Gleb Udintsev of the Institute of Oceanology of the Soviet Academy of Sciences, Leg 38 yielded core samples that indicate a complex history of shifting stresses and sinking landmasses covering as much as 40 million years. Seventeen holes were drilled, including one only 800 miles from the North Pole.

Beginning about 55 million years ago, the split began with the opening of what is now the Norwegian Basin, a body of deep water off the Norwegian coast. For 25 million years the spreading continued, the core samples suggest, during which time the line along which the opening was taking place moved about 100 miles to the west. Then, as the widening continued, a huge strip of Greenland's coast broke off and also moved westward, finally sinking beneath the waves to form the Jan Mayen Ridge, a strangely linear submerged plateau that resembles a continuous mountain range hundreds of miles long. During this 15-million-year episode the line of opening moved again, so that it now passes through Iceland.

It was probably not until the final phase of this whole period, perhaps less than 20 million years ago, that the Norwegian Sea became truly open to the warmer waters of the Atlantic to the south. Core samples from the now-submerged Iceland-Faroe Ridge, descendant of the Norwegian Sea's ancient southern boundary, reveal lavas apparently extruded at or above sea level. These traces hint that it was not until these latter years that the ridge slipped below sea level, finally letting in the Atlantic water and easing the harsh climate of Scandinavia and the eastern Arctic. □

EPA bans Dieldrin and Aldrin on crops

The Environmental Protection Agency has won an important legal step in the four-year-long dispute over the pesticides Aldrin and Dieldrin, and has suspended most of the production of the chemicals. But neither the Environmental Defense Fund (EDF), initiators of the campaign against the pesticides, nor Shell Oil Co., sole producer, is satisfied with the latest decree, and court battles will continue.

Attorneys for EDF, a Washington-based environmental law firm, have been trying for years to stop Shell's production of the two chlorinated hydrocarbons, used primarily on corn crops in the Midwest and citrus crops in the southern United States. Shell has been making about 10 million pounds per year for agricultural purposes. Environmental researchers have evidence that the pesticides are slow to degrade and are carcinogenic to mice and that their residues are found in almost all commercial foodstuffs and in 99.5 percent of the human tissues analyzed.

A cancellation hearing has been under way in EPA's administrative law court for several months on a joint move by EDF and EPA to ban all agricultural uses of the pesticides. In August, EPA Administrator Russell E. Train issued a notice of the agency's intention to suspend further production of the pesticides until the full cancellation case is resolved next spring (SN: 8/10/74, p. 87). The administrative law court approved the suspension in September, and EPA last week ordered a ban on the production of Aldrin and Dieldrin for agricultural uses until the full case is decided. The ruling states that any stocks of the chemicals formulated into the products before Aug. 2 of this year may be sold for agricultural uses, but those formulated after Aug. 2 may be sold only for three specific, nonagricultural purposes: termite control, dipping the roots and tops of nonfood plants and moth-proofing in places with no waste water runoff. These uses were cleared by the EPA in 1972, and a spokesman says Shell will produce about one and a half to two million pounds per year for these purposes.

The cancellation case will continue in the administrative law court, but Shell and EDF have both filed petitions in U.S. district courts for review of the suspension order. EDF lawyers want to see a complete ban on production and sales of remaining stocks, and Shell wants the limited production ban overturned. □