

The evolution of kin support

A basic principle of evolutionary biology is that animals internalize behavioral "strategies" in order to maximize reproductive success and improve the fitness of the family lineage. The theory explains apparently self-sacrificial behavior as a "kin selection" strategy—individual sacrifice made in exchange for genetic representation in the future family line. The theory has generated considerable controversy over the past two decades, and in the wake of that controversy scientists have begun to test the theory's usefulness in predicting actual social behavior. According to Susan M. Essock-Vitale and Michael T. McGuire of the University of California at Los Angeles, sociobiological theory predicts that individuals will be more altruistic toward close kin than toward distant kin because close kin carry more of the individual's genetic legacy. In addition, kin support should be directed so as to increase relatives' reproductive success. Essock-Vitale and McGuire interviewed 300 women and found "strong support" for the sociobiological predictions. In relationships with friends, the subjects reported far more reciprocal exchanges—receiving support in exchange for giving support—than they did in relationships with kin, where helping was more often unrequited. The subjects were much more apt to help close kin than more distant kin, regardless of geographical proximity, and investment was most apt to flow from older to younger kin. In addition, subjects were more apt to help siblings whom they rated as likely to have children, and they received more help from siblings whose own children were grown. "Our perceived motives notwithstanding," the researchers conclude, "rather than having the best interests of others at heart, our patterns of helping suggest that we appear to help in ways that will maximize our own inclusive fitness."

... and grandparenting

Sociobiology also predicts, because paternity is always less certain than maternity, that grandparents will tend to invest more in the survival of their daughters' children than their sons' children. In order to test this principle, Martin S. Smith, a psychologist at Simon Fraser University in British Columbia, surveyed almost 600 grandparents in North America concerning their relationships with their grandchildren. He found that the subjects spent about 40 percent more time with their daughters' children than with their sons' children. Smith also found that grandparents—and especially grandfathers—tend to spend more time with granddaughters—"a better reproductive bet," Smith suggests—than with grandsons. And in contrast to parenting patterns, grandfathers reported spending only slightly less time than grandmothers in grandparenting. When males are young, Smith speculates, they have other more profitable options for maximizing genetic fitness; as these options decrease, males turn to kin investment. "In the fitness game," Smith suggests, "a poor bet is better than no bet at all."

... and senescence

Do the behaviors that typify old age have an evolutionary component? UCLA anthropologist Marc D. Hauser compared the behaviors of old and young stump-tail macaques, and found that the old subjects were not only less active but that they voluntarily restricted their social network, ignoring and avoiding engagement with other group members—especially non-kin. Although the pattern could be explained by the physical depletion that accompanies aging, Hauser concedes, it is also possible that senior group members, with depleted investment potential, become more discriminating in social interaction, wasting less energy on activity with no potential for genetic payoff.

Leukemia and magnetic or electric fields

While updating a study of 438,000 deaths among working men in the state of Washington during 1950 and 1979, Samuel Milham Jr. noticed a higher than expected incidence of leukemia among those whose jobs required them to work around high electrical or magnetic fields. What first caught his attention were statistics associated with aluminum workers. This group experienced roughly twice the number of deaths from leukemia as would have been expected. Looking at only acute forms of leukemia, the rate was elevated 150 percent above the norm.

The prevailing wisdom, says Milham, is that any leukemia excess in this group is probably due "to inhaling coal-tar-pitch volatiles that come off as part of the [aluminum] reduction process." But, points out the epidemiologist with Washington's Department of Social and Health Services, "coke-oven workers are exposed to the same thing—at much higher levels—and they don't show any leukemia excess."

Since strong magnetic fields are induced by high (75,000 ampere) direct currents used in the aluminum-reduction process, Milham's attention turned to electric- and magnetic-field exposures. He broke out data for 10 other occupational groups in which workers might be expected to encounter high fields: electronic technicians, radio and telegraph operators, electricians, power and telephone linemen, radio and television repairmen, motion-picture projectionists, electrical engineers, streetcar/subway motormen and welders/flame cutters. As Milham reports in the July 22 *NEW ENGLAND JOURNAL OF MEDICINE*, only welders and flame cutters show no leukemia excess. Together these groups exhibit a proportionate mortality ratio (ratio of observed deaths to expected deaths, multiplied by 100) of 137 for all leukemias and a PMR of 163 for acute forms. Highest PMRs occur among power-station operators (259 for all leukemias, 282 for acute forms) and television and radio repairmen (291 for acute leukemias).

"I'm hoping to follow up union or factory groups that are exposed to [high fields] and see whether those with highest exposures are the ones with the mortality excess," Milham says. Right now, he is examining death records for men in this apparent high-risk group to see whether all forms of leukemias are represented, or whether there appears to be selective preference.

Radiation-induced reproductive changes

Healthy 10-year-old rhesus monkeys developed testicular changes after long-term chronic irradiation with cobalt-60 gamma rays, according to a report in the April *SCIENTIA SINICA* by Wu Cheng and colleagues at the Institute of Biophysics of the Academia Sinica in Beijing, China. With 0.8 rad per day exposures, the researchers were able to shut down the animals' sperm production when the accumulated dose reached 100 to 212 rads—half that necessary to achieve the same effect using a single dose. And "repair after acute exposure... appeared more rapidly than that after chronic irradiation," the Beijing team reports.

The Chinese study involved 36 animals: an unspecified number in group A received 0.15 rad/day, the 17 animals in group B got 0.8 rad/day, others received no radiation. Even after 3 years of continuous irradiation, sperm count and testis volume remained normal in group A, although occurrence of sperm shape and chromosome abnormalities did increase. In group B, however, testis atrophy appeared within only 2 months. As the cumulative dose reached 40 rads, sperm count fell. After 5 to 11 months of irradiation (100-212.8 rads), sperm production moved toward complete shutdown. Recovery of sperm production began in some group B animals a year after exposures ended, but even three years after irradiation not all animals had recovered.