



Creating the Nation's first BioPark

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Letter From the Desk of David Challinor
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An easy way to stir up trouble or to garner attention is to challenge a concept that has been comfortably held for generations. Most humans are inherently conservative and become uncomfortable with an unexpected challenge to long-accepted tenets. Some individuals can never adjust, and I suspect you could still find today some "flat-earthers." This letter will consider some recent cases in which scientists have challenged long-held assumptions on evolutionary paths and accepted theories on animal behavior. Eventually such initially radical insights may become almost universally accepted for many years by the scientific community as further experiments support the initial hypothesis. Such acceptance is not necessarily permanent; the findings can be successfully challenged in the future.

The first new challenge I will discuss was generated by two primatologists at the University of California at Davis, Anthony DiFiore and Drew Randall. Starting in the 1960's, most anthropologists who studied primates for clues to human evolution concentrated on old world apes and monkeys, particularly chimpanzees because genetic evidence indicated that humans and chimpanzees split from a common ancestor only about 8 million years ago -- a short evolutionary time. Furthermore, the fossil record to date shows that early hominids seem to have first appeared in Africa from where, in a relatively short time, they migrated north and northeast into what is now Europe and Asia.

DiFiore and Randall published a paper last year in the Proceedings of the National Academy of Sciences pointing out that new world primates could be just as important as old world ones in analyzing the background for human behavior, despite the much wider time spread in the evolutionary tree between them and humans; these two groups more closely shared behavioral characteristics than humans and old world primate stocks.

Primate fossils are found in both old and new world sites; the earliest North American ones date back to the middle Paleocene -- about 65 million years ago. These North American primates died out and appear unrelated to today's Central and South American primates whose fossil precursors date back to the Miocene (about 20 million years ago). We do not know from where the new world monkeys evolved, but they may have floated across the Atlantic on islands of vegetation washed down West African flooded rivers, perhaps 20 million years ago when the two continents were much closer together.



The old and new world primates thus proceeded separately on their evolutionary journey for about 20 million years and successfully adapted to their respective environments. What is noteworthy, however, is that new world monkeys seemed to have evolved a sexual flexibility and a broader range of social structures than their old world counterparts. Human behavior seems to parallel that of new world primates from which they are evolutionarily more distant than old world ones. For example, among the cercopithecines (old world monkeys) many or most species behave similarly in having females remain in their maternal troops, whereas males leave their natal band at sexual maturity and disperse to new groups. Males compete for receptive females but do not form strong bands among themselves (unlike chimpanzees and gorillas, see my letter of March 1992). The relationship between males and females, especially among baboons, is hierarchical, with males dominating females; each individual in the troop -- male and female -- occupies a definite rank order that is maintained constantly by acts and displays of dominance and submission.

Among new world monkeys the characteristic of greater behavioral flexibility is seen in the monogamous relations of tamarins, where the male participates directly in raising the young. In other new world species females mate with all available males, which seldom fight one another for access, as do old world male monkeys. The hierarchical patterns of dominance, so common in the old world monkeys, seem remarkably absent in the new world ones. Thus new world primates exhibit a wide variety of breeding strategies, from monogamy to polygyny, that parallel that of the great apes, e.g. polygyny in gorillas, polygyny and polyandry in chimpanzees, and monogamy in gibbons of Southeast Asia. There is still much to learn about the subtle differences in behavior of old world monkeys, but it is increasingly evident that anthropologists must now give more weight to the nonhierarchical and flexible lifestyles of new world monkeys in analyzing the evolution of human sociability.

Another recent example of research that has "rocked the boat" was published 30 June 1995 in SCIENCE (268: 1897-1899). A group of British scientists studied the breeding patterns within a colony of grey seals. This species lives on both sides of the North Atlantic, in the Gulf of St. Lawrence and off the coasts of Newfoundland, and around Iceland, the British Isles, the Norwegian coast and in the Baltic. The males are large -- just under 10 feet long and weigh up to 650 lbs. Females are a few feet shorter and about 100 lbs. lighter. Old bulls and pregnant cows assemble on beaches about a month before breeding begins. When births start the bulls stake out and defend their territories, with the dominant bulls claiming the best sites for breeding, generally those farthest inland. About two weeks after birth the female is ready to be bred, and dominant polygynous

bulls cover six or seven females. As gestation is only nine months, the fertilized ova, or blastocyst, waits in the uterus for three months before implanting, thus allowing birth on an annual basis. This is called delayed implantation and is not uncommon in mammals.

Conventional wisdom assumed that dominant males fathered most of the pups, with subdominant males breeding with only a few scattered females they intercepted traveling through their small territories. The recent use of molecular genetics has allowed scientists to test paternities and, in the case of grey seals, the results are surprising.

For easy identification the researchers branded 85 dominant males and 88 females from one colony. They predicted that most of the pups born in successive years would be sired by the same dominant male, making the young full brothers or sisters. However, the dominant branded males actually sired disproportionately fewer full siblings than subdominant unbranded males. This result led to the conclusion that females and certain males established strong bonds independent of dominance status and coordinated their travels and behavior to insure that they bred with each other annually. The preference for previous partners was demonstrated statistically, but the way this preference evolved or is carried out is still a mystery.

One possible explanation may be the degree of pre-weaning pup mortality. Many pups are killed by the aggressive actions of competing dominant males. Experienced females therefore may learn that mate fidelity could reduce the threat of a newborn being accidentally killed in fights between males and thus they developed a strategy to increase the survival of their offspring by finding less aggressive males with which to breed. How such a technique for mate selection might have evolved is still unknown, but it serves as yet another example in diverse animals of female choice in the selection of mates.

The new insights into the role of new world monkeys in understanding the evolution of early human sociality and of the heretofore unsuspected role of female grey seals in choosing their mates are but two recent examples of the kind of new investigations that question established beliefs. Throughout history many well-known scientists and thinkers have had the temerity to question orthodox attitudes. Copernicus' heliocentric view of the solar system was espoused by Galileo, who found himself in serious trouble with the politically powerful Roman Catholic Church. Einstein advanced his general and special theories of relativity in the early 1900's in the face of perceived wisdom. Relatively few people even understood what he was writing about. The hypotheses of an expanding

universe or movement of the earth's tectonic plates, once new and iconoclastic, are increasingly accepted; we can expect other icons to fall. The important point to remember is that open-minded, skeptical individuals are crucial for the welfare of our society. Their hypotheses are not always easy to verify, but if at all legitimate, their novel insights should be encouraged, for only with man's trailblazing thoughts can the human species continue to evolve.

David Challinor
202/673-4705
202/673-4607 FAX