PRIMATE PHOTOPIGMENTS AND COLOR VISION. Neitz, J. and Neitz, M., Medical College of Wisconsin, Milwaukee, WI 53226

There have been recent advances in understanding of the photopigment basis of primate and human color vision. These can be understood by starting from an evolutionary viewpoint. The vertebrate cone visual pigments have evolved along at least four lines. In many birds and fish these are the basis of vision that employs four cone types. However, presumably because of a long period of nocturnality during their evolution, among mammals it appears that only two cone-pigment family members have survived. In most mammals, the two remaining cone pigments are the basis of dichromatic color vision. In this system, information about wavelength is derived from the neural comparison of outputs of two cone types, one sensitive to shorter (S), and one sensitive to longer wavelengths (M/L). In this reduced form of color vision all possible wavelength combinations are seen as belonging to just two perceptual hue categories. Literally, only two colors are seen. Among mammals it is only primates who have evolved the photopigments to extend color vision to an additional dimension. Primates have replaced the single (M/L) pigment gene of lower mammals with a tandemly repeated array of highly homologous pigment genes. In primates, genes in the X-chromosome array have diverged to produce pigments with a variety of spectral differences and a unique second color vision system based on these differences has evolved. In humans, recombination among these genes has produced a large variety of photopigment genotypes. These translate to individual differences in the photopigments and the number and variety of cones that express them.