of different X chromosomes in female monozygotic twins, and in some extremely rare cases, due to aneuploidy , twins may express different sexual phenotypes , normally from an XXY Klinefelter syndrome zygote splitting unevenly.
Monozygotic twins, although genetically very similar, are not genetically exactly the same. The DNA in white blood cells of 66 pairs of monozygotic twins was analyzed for 506,786 single nucleotide polymorphisms known to occur in human populations. Polymorphisms appeared in 2 of the 33 million comparisons, leading the researchers to extrapolate that the blood cells of monozygotic twins may have on the order of one DNA-sequence difference for every 1.2 x 107 nucleotides, which would imply hundreds of differences across the entire genome. The mutations producing the differences detected in this study would have occurred during embryonic cell-division (after the point of fertilization). If they occur early in fetal development, they will be present in a very large proportion of body cells.
Another cause of difference between monozygotic twins is epigenetic modification, caused by differing environmental influences throughout their lives. Epigenetics refers to the level of activity of any particular gene. A gene may become switched on, switched off, or could become partially switched on or off in an individual. This epigenetic modification is triggered by environmental events. Monozygotic twins can have markedly different epigenetic profiles. A study of 80 pairs of monozygotic twins ranging in age from three to 74 showed that the youngest twins have relatively few epigenetic differences. The number of epigenetic differences increases with age. Fifty-year-old twins had over three times the epigenetic difference of three-year-old twins. Twins who had spent their lives apart (such as those adopted by two different sets of parents at birth) had the greatest difference. However, certain characteristics become more alike as twins age, such as IQ and personality.