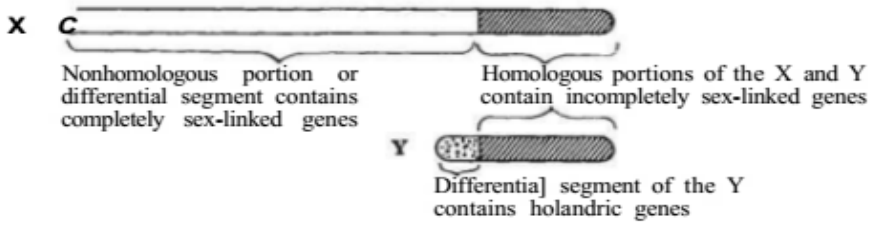
SEX-LINKED INHERITANCE

Any gene located on the X chromosome (mammals, Drosophila, and others) or on the analogous Z chromosome (in birds and other species with the ZO or ZW mechanism of sex determination) is said to be sex-linked. The first sex-linked gene found in Drosophila was the recessive white-eye mutation.

This peculiar type of inheritance is due to the fact that the Y chromosome carries no alleles homologous to those at locus on the X chromosome. In fact, in most organisms with the Y-type chromosome, the Y is virtually devoid of known genes. Thus males carry only one allele for sex-linked traits. This one-allelic condition is termed homozygous in contrast to the homozygous or heterozygous possibilities in the female.

VARIATIONS OF SEX LINKAGE

The sex chromosomes (X and Y) often are of unequal size, shape, and/or staining qualities. The fact that they pair during meiosis is indication that they contain at least some homologous segments. Genes on the homologous segments are said to be incompletely sex-linked or partially sex-linked and may recombine by crossing over in both sexes just as do the gene loci on homologous autosomes. Genes on the nonhomologous segment of the X chromosome are said to be completely sex **linked** and exhibit the peculiar mode of inheritance described in the preceding sections. In humans, a few genes are known to reside in the nonhomologous portion of the Y chromosome. In such cases, the trait would be expressed only in males and would always be transmitted from father to son. Such completely Y-linked genes are called holandric genes (Fig.).



SEX - INFLUENCED TRAITS

The genes governing sex-influenced traits may reside on any of the autosomes or on the homologous portions of the sex chromosomes. The expression of dominance or recessive ness by the alleles of sex influenced loci is reversed in males and females due, in large part, to the difference in the internal environment provided by the sex hormones. Thus examples of sex-influenced traits are most readily found in the higher animals with well-developed endocrine systems.

Example: The gene for pattern baldness in humans exhibits dominance in men, but acts recessively in women.

Genotypes	Phenotypes	
	Men	Women
b'b'	Bald	Bald
b'b	Bald	Nonbald
bb	Nonbald	Nonbald

SEX-LIMITED TRAITS

Some autosomal genes may only come to expression in one of the sexes either because of differences in the internal hormonal environment or because of anatomical dissimilarities. For example, we know that Mammalian have many genes for milk production that they may transmit to their daughters, but they sons are unable to express this trail. The production of milk is therefore limited to variable expression in only the female sex. When the penetrance of a gene in one sex is zero, the trait will be sex-limited.