GENIC BALANCE THEORY

By studying sex chromosomal mechanism of sex determination, it may appear at first glance that some genes carried by the sex chrms, X and Y were entirely responsible for sex. But this is not the case. Extensive experimentation (Wilson, 1909 ; Bridges, 1921 ;) on different organisms has revealed the fact that most organisms generally have inherent potentialities for both sexes as every individual has in his genotypes both male and female determining factors. There seems to exist a delicate **balance** of masculine and feminine tendencies in the hereditary compliment of an individual, and mechanisms like the XY, ordinarily serve to trip the balance in one direction or another. Such **genic balance** mechanism of determination of sex was first of all studied in Drosophila by **C.B. Bridges** in 1921.

SEX DETERMINATION IN DROSOPHILA

In Drosophila melanogaster, sex is determined by the ratio of the X-chromosomes and the autosomes, rather than the sex chromosomes, themselves. The X-chromosome carries more genes which incline the development of the individual towards femaleness and the autosomes more towards maleness. Thus, which sex will be actually developed, is decided by the balance of these two types of chromosomes.

The Y chromosome contains no sex-influencing genes, and is of no importance in sex determination. It does however, contain male-fertility factors, XO flies being male, but sterile.

If each haploid set of autosomes carries factors with a male-determining value equal to one (1), then each X chromosome carries factors with a female determining value of one and half ($1\frac{1}{2}$).

Different combinations of X-chromosomes and autosomes, with sex ratio and corresponding sex expressions in Drosophila are shown below :

Chromosome complement		Sex Index X/A	SEX
X-chrms X	Sets of autosomes : A		
3X	2A	1.5	Super female
4X	4A	1.0	Tetraploid — Normal Female
3X	3A	1.0	Triploid — Normal Female
2X	2A	1.0	Diploid — Normal Female
1X	1A	1.0	Haploid — Normal Female
2X	3A	0.67	Intersex
1X	2A	0.50	Normal male
1X	3A	0.33	Super male

If the ratio of X/A in any individual is 1.0, it will be a female, and if 0.5 it is male. When the ratio is intermediate (0.67) between 1.0 and 0.5, the resulting individual is neither a female nor a male but an intermediate or **intersex.** Superfemales have a ratio of 1.5 and supermales have a ratio lower than the normal male.