The practice, common in current X-ray therapy, of giving treatments that do not certainly result in permanent sterilization, has been defended chiefly on the ground of a purely theoretical conception that eggs produced after the return of fertility must necessarily represent “uninjured” tissue. As this presumption is hereby demonstrated to be faulty it would seem incumbent for medical practice to be modified accordingly, at least until genetically sound experimentation upon mammals can be shown to yield results of a decisively negative character. Such work upon mammals would involve a highly elaborate undertaking, as compared with the above experiments on flies.

Hermann Muller: Nobel Lecture December 12, 1946
As we can infer with certainty from experiments on lower organisms that all high-energy radiation must produce such mutations in man, it becomes an obligation for radiologists - though one far too little observed as yet in most countries - to insist that the simple precautions are taken which are necessary for shielding gonads, whenever people are exposed to such radiation either in industry or in medical practice. And, with the coming increasing use of atomic energy, even for peace-time purposes, the problem will become very important of insuring that the human germ plasm - the all important material of which we are the temporary custodians - is effectively protected from this additional and potent source of contamination.
Drosophila Genetics

1) Genes: 17,728 genes – 13,907 protein coding and 3821 identified RNA non-coding genes

2) Genome size: 143 MB – about two-thirds euchromatin (blue in fig below) and one-third heterochromatin (yellow in fig below)

3) Four chromosomes: 1 (X), 2, 3, 4 (Dot)

Polytene chromosomes:
G1 -> S -> G1 -> S -> ..... (no M phase or chromosome separation)
Polypolene chromosomes

3) Four chromosomes: 1 (X), 2, 3, 4 (Dot)

4) Sex determination: sex in Drosophila is determined by the ratio of X chromosomes to autosomes, not the presence of the Y chromosome.

- 1X:2A or 0.5 = male; 2x:2A or 1 = female
- XY or X0 = male; XX or XXY female
Other common types of chromosomal aberrations

1) Deficiency: Df(3R)XYZ

2) Duplication: Dp(3R:3R)ABC

3) Transposition: Dp(1;2)

4) Reciprocal Translocation:

- Philadelphia Chromosome: Reciprocal translation b/w Chromosomes 9 and 22: BCR-Abl fusion gene (CML)

- Burkitt’s Lymphoma: Reciprocal translation b/w Chromosomes 8 and 14: myc gene placed near Ig gene
Keys to fly genetics

1 + 2) Mendel’s Laws and No Recombination in males

3) Balancer Chromosomes: Four key features of balancer chromosomes

A) Multiply inverted: suppress essentially completely the ability to get recombinant progeny

Chrom. 3: 61A1……………………………………80F 81A1……………………………………100F3