Introduction to Psychology
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Lecture - 29
Nature vs Nurture

Now that we have understood couple of psychological processes, such as how do we perceive, how do we understand the world, how do we retain information that we acquire in our life, how emotion gets triggered.

Now let us come to a very different type of a topic which has it is origin in a controversy. Why are we the way we are? Is it that behave in heritage certain things from our parents and therefore we behave in a particular way or is it that we have acquired certain things from our environment which makes us react to situation the way we do. So nature, nurture controversy that you always read about, that you always hear about that is what we are going to discuss today.

My basic intension is basically to introduce you two certain scientific facts that has to do with genetics. And then I will now take up certain findings of behavioral genetics to tell you that how is it that now people give credit for that type of situation to the genetic makeup as well as to the environmental factors, the external factors.

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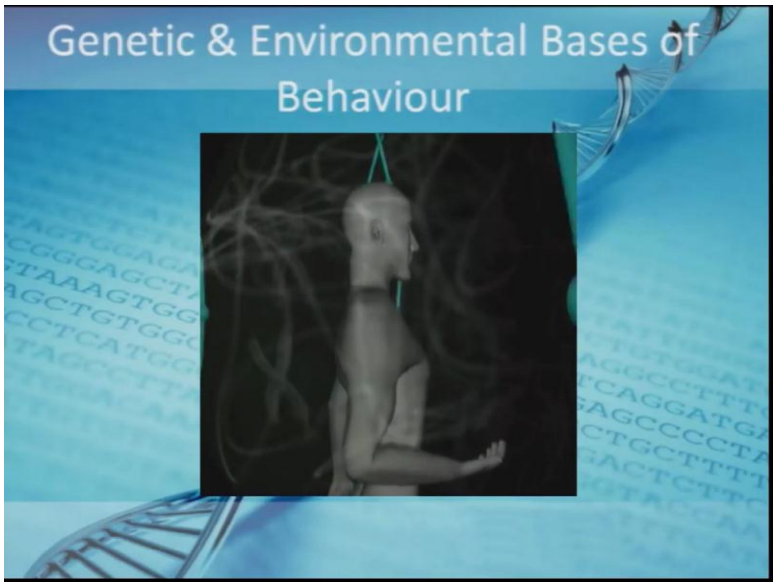

So, we would be basically talking about the gene environment interaction and how this interaction of the genetics and the environmental determinants they provide base to our behavior.

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Now look at your screen, you see two kids and then the obvious thing that you basically look at is the resemblance between the faces of these two children. Now this is something that we have always been told that see if you have a twins later on we will even discuss fraternal and identical a twins. If you have no children of the same parents, if you have members of the same family and so forth people do search for certain resemblance; that resemblance could be in terms of their appearance and that resemblance could be even know for certain other thing.

So, right now they took it that you look at you search for similarity in their physical appearance. Did you find anything? Look at this, now both of them have grown up a bit. Again look at the resemblance between their faces. Now again try to match when they are younger compared to when they became little older.

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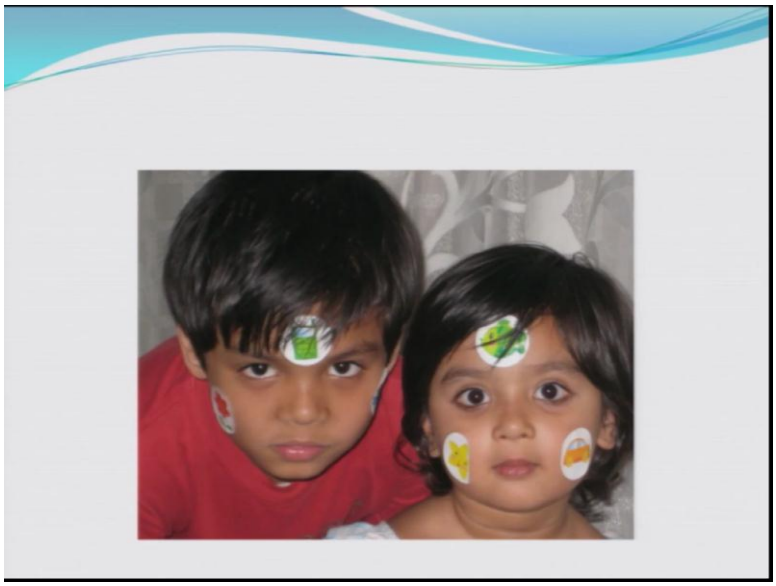

And now when they have further grown up; so the same kid three different life stages of these two siblings and you look at their resemblance.

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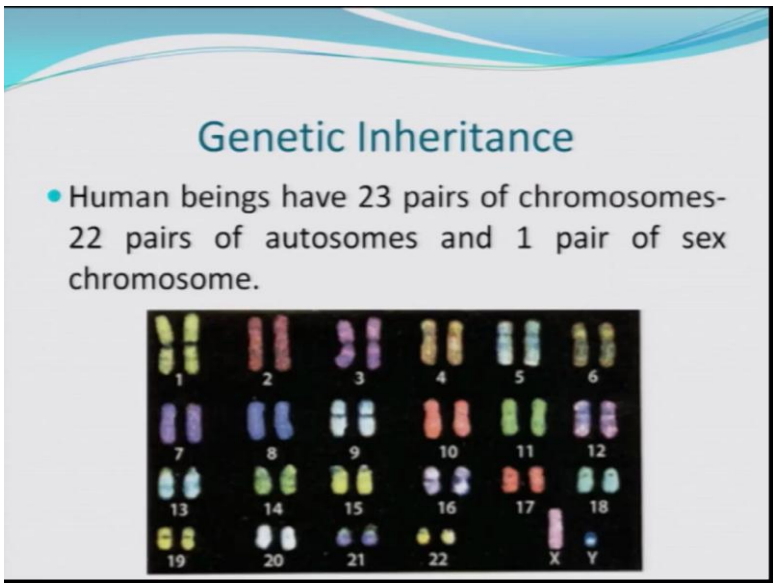

Now, resemblance is something that we always look for when we look at any two objects, here it is the human faces. Psychologically what we would be interested in is the resemblance in the pattern of response. So, the sibling that we saw here do they reflect certain type of mirror image in terms of their behavioral response.

Say for instance, their pattern of interacting with others, their pattern of certain choices, their behavioral manifestation of certain emotional states, is they are a resemblance. And this is something that psychology gets interested in and this is what brings genetic and psychology come together.

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From the behavioral science point of view when we look at the human being we tried to understand his or her personality; intelligence, memory, problem solving, ability thinking, style and so forth. We are more interested in understanding the ability of what this very individual can do. What we would do as part of this very discussion is; we would initially know spend some time understanding the genetic inheritance pattern, then we would come across certain key terminologist we will try to understand them what each of them mean. Then we would also understand two basic biological processes; the process of mutation and recombination that provides variation to human beings, both in terms of their appearance as well as in terms of their behavioral manifestations.

And once we do all this then we would gradually move towards behavioral genetics where we would be taking a specific type of behavior, specific type of psychological abilities. And then try to see how much of credit for this type of inability can be given to psychology, the environment or the genetics.

We will even not take care of certain issues like say (Refer Time: 05:36) autism, dyslexia. We will now try to take no variations of examples right from normal to clinical staff and then try to know understand how this gene environment interaction takes place. Coming back to the basis of genetic inheritance, we all know that human beings have 23 pairs of chromosomes and of this 23 22 are autosomes. On your screen you see these 23 pairs one pair is sex chromosome.

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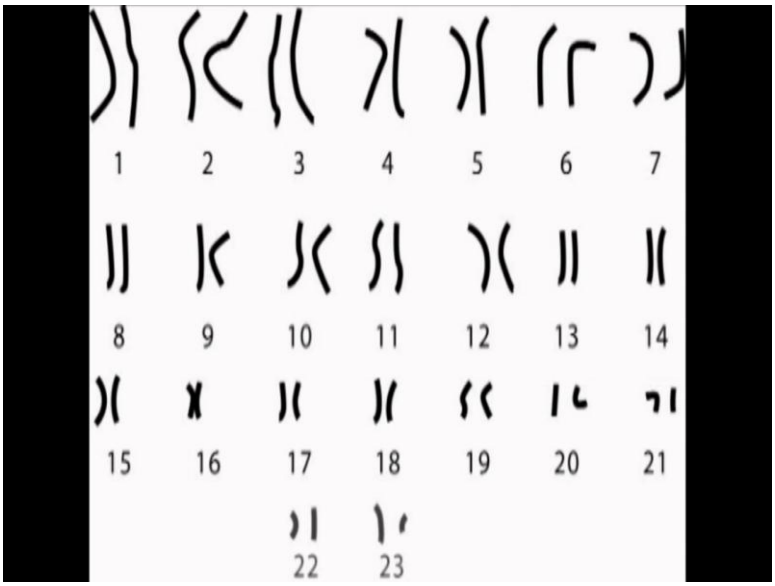

As I told you that we all have 23 pair of chromosomes, 22 pairs are autosomes and 1 is the sex chromosome.

So, if you inherit x x from the two parents the father and the mother, then you become female and if you inherit y from the father and x from the mother then you become a male. This is the basic genetic inheritance that we are aware of.

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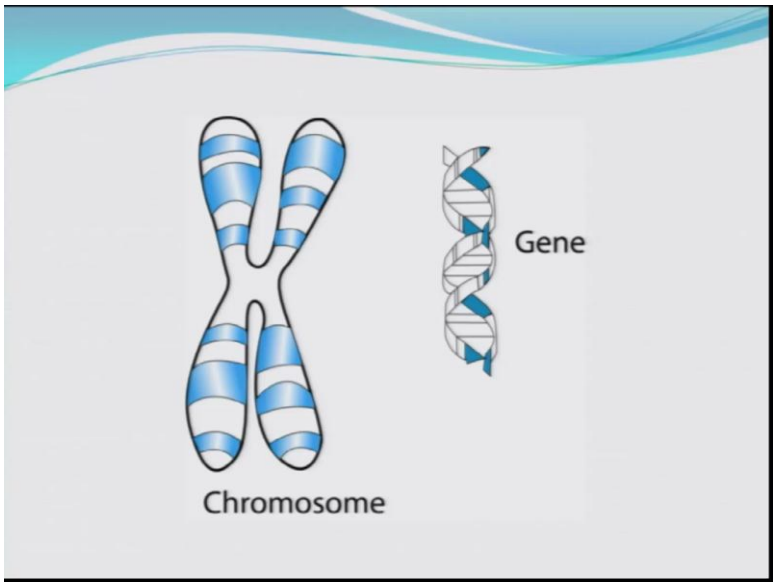

Chromosomes usually this is how you see and then know on the right hand side you see the DNA structure the double helical structure and the genes.

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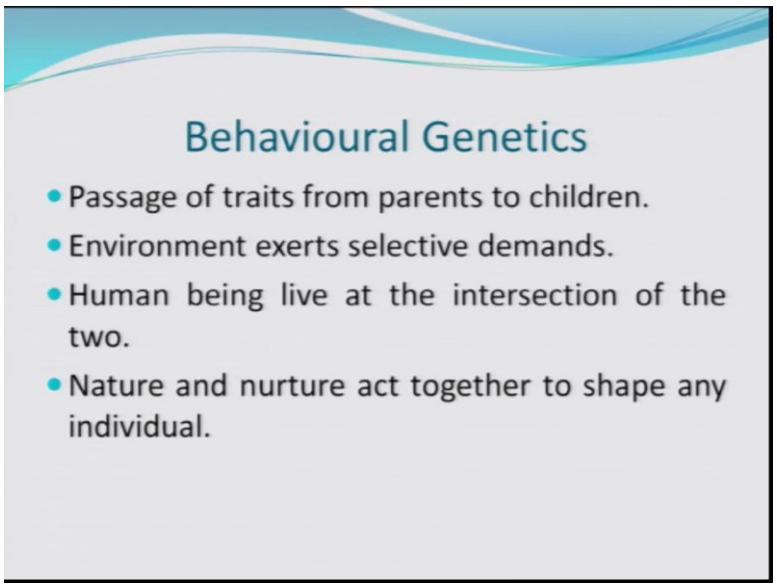

Now, it has been understood that there are certain traits that pass from parents to children. Behavioral genetics is that branch of science which basically looks at the passage of traits from the parents to children. Remember we are not talking about the passage of genes from parents to children rather we are talking about the trait. If you remember the trait approach to personality talks about certain basic (Refer Time:

07:24), certain basic characteristics; cardinals trait, secondary traits. So, actually what happens? Behavioral genetics understands accepts and explains that the traits they pass from parents to children; and this is how it transmitted from one generation to the other.

The second important thing that environment also exerts certain selective demand. So, the environment in which you are it compels you to adapt to the situation and therefore certain demands are exerted on you. Now human beings they live at the intersection of these two. You have the passage of the traits, you have the passage of the genes and at the same time there are certain extra news demands that environment impose on you. And therefore what happens the nature and the nurture they act together to shape us an individual the way we look in our real life to others.

Now, DNA is basically comprised of four different nucleotides which are also called as bases.

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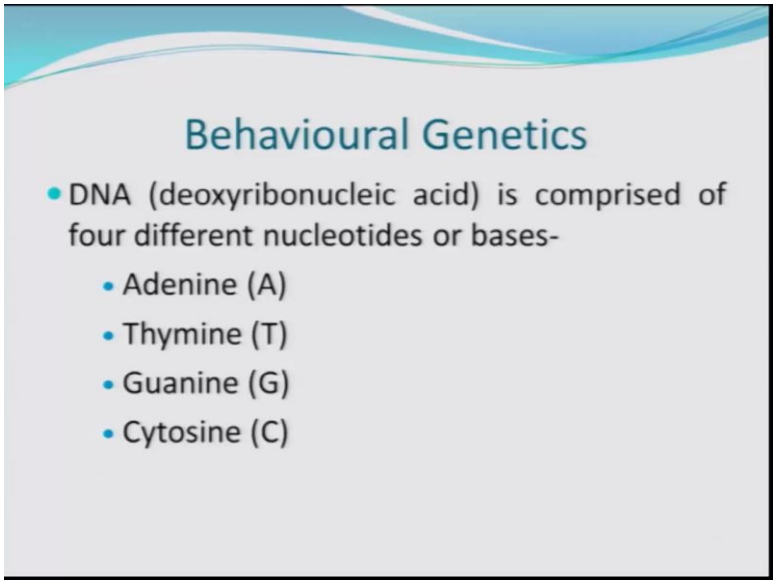

Adenine, thymine, guanine, cytosine; so these are the four bases, these are the four nucleotides.

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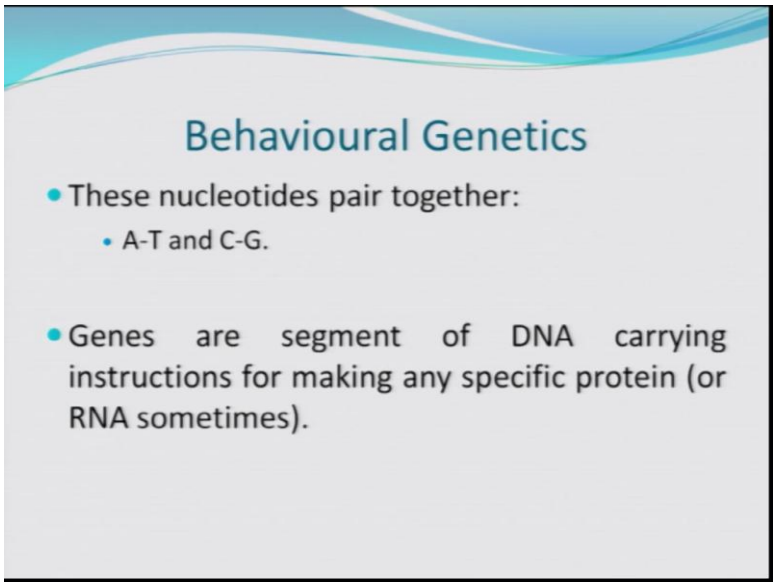

Now, what happens that these nucleotides they form pairs. So, A-T and C-G these are the two pairs. So, adenine and thymine they pair together and cytosine and guanine they pair together. Now the genes that we are talking about they are basically segments of DNA that carrying instructions for making any specific protein, and some time it could be even true for certain RNA is also.

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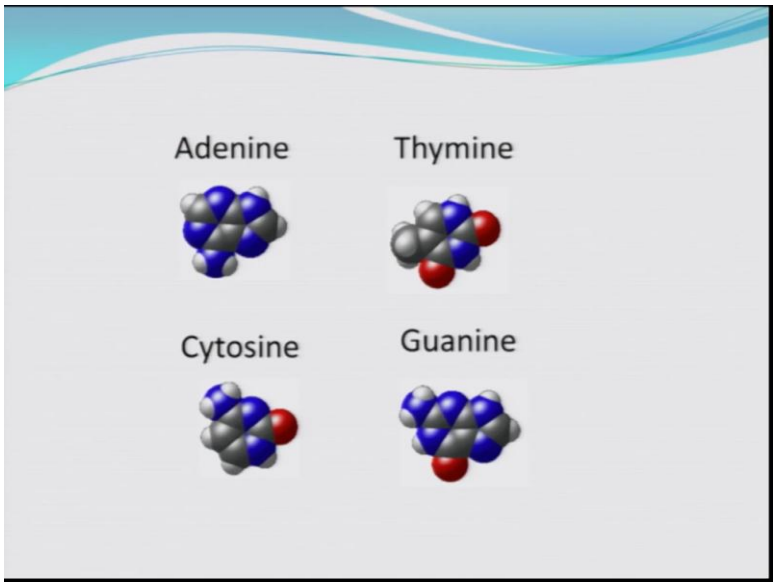

Now, on your screen what we seen is the structure of adenine, thymine, cytosine and guanine; how they a look like chemically.

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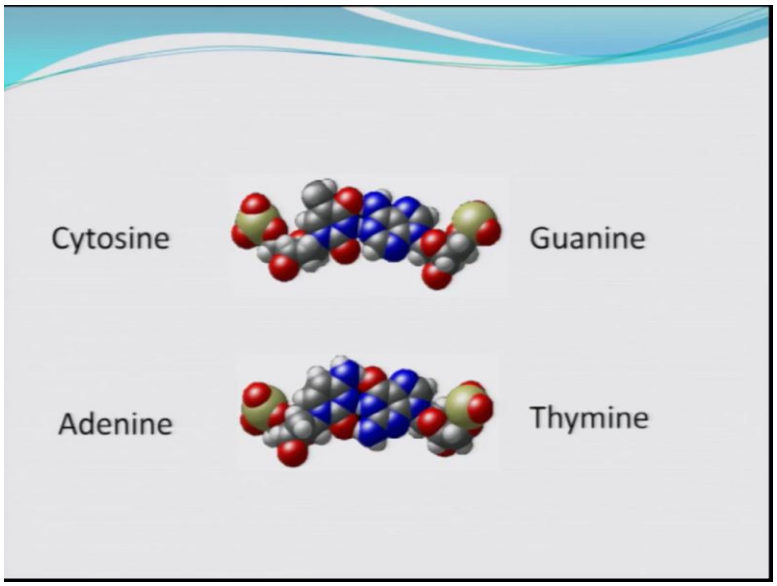

And when they form the pair; now cytosine and guanine you see on the top and adenine and thymine you see at the bottom. So, this is the pair that we have.

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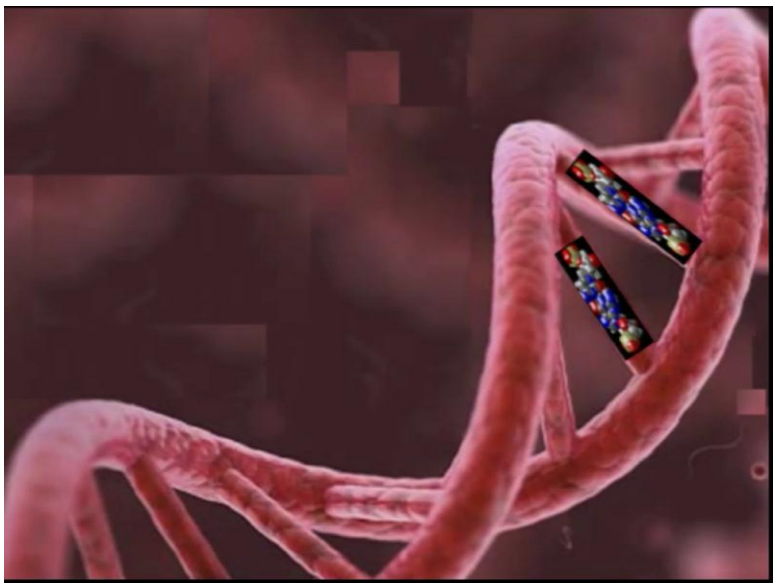

The double helical structure of gene that we have; we have a sequence of A-T, C-G bonds that is overlaid over it.

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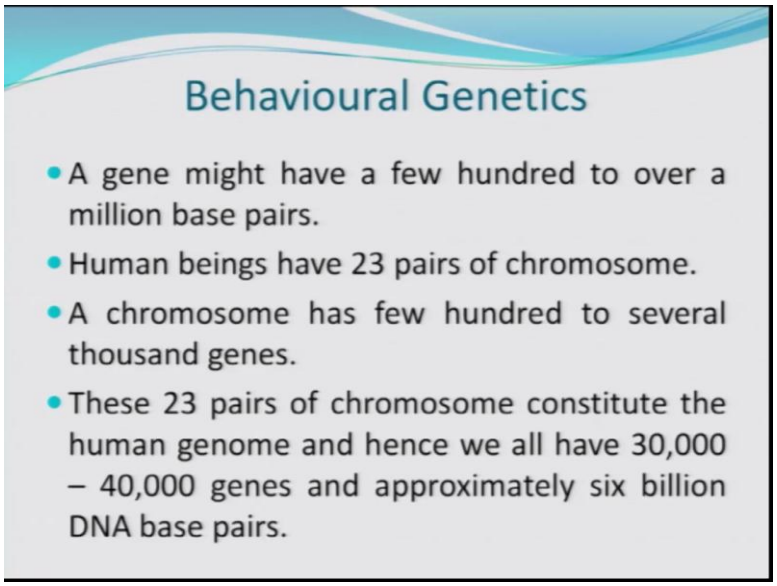

Now, a gene might have a few hundred to over a million base pairs. And as we discussed right now that we all have 23 pairs of chromosomes and a chromosomes has some few hundreds to few thousands genes and these 23 pairs of chromosomes they constitute the human genome. And hence we all have somewhere around 33000 to 40000 genes and approximately six billion DNA base pairs.

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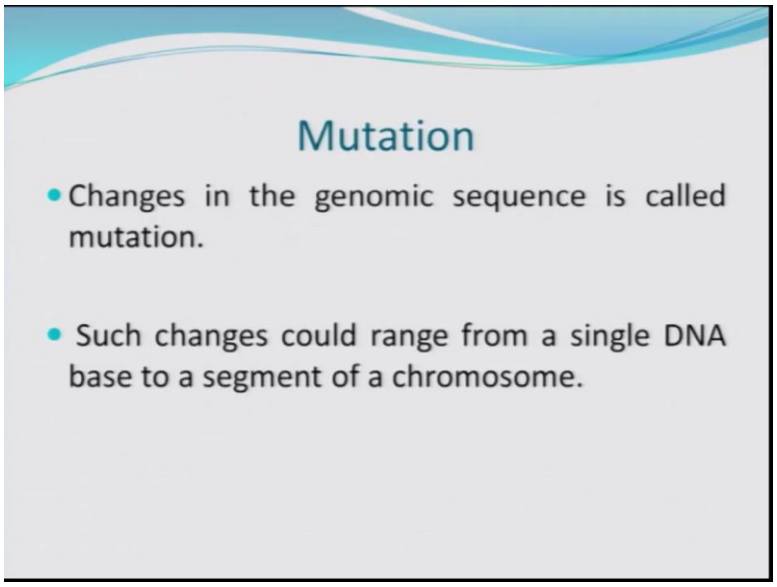

Now we come to mutation, Mutation basically is a process of change in the genomic sequence and such changes basically it could range from a single DNA base to a segment of a chromosome.

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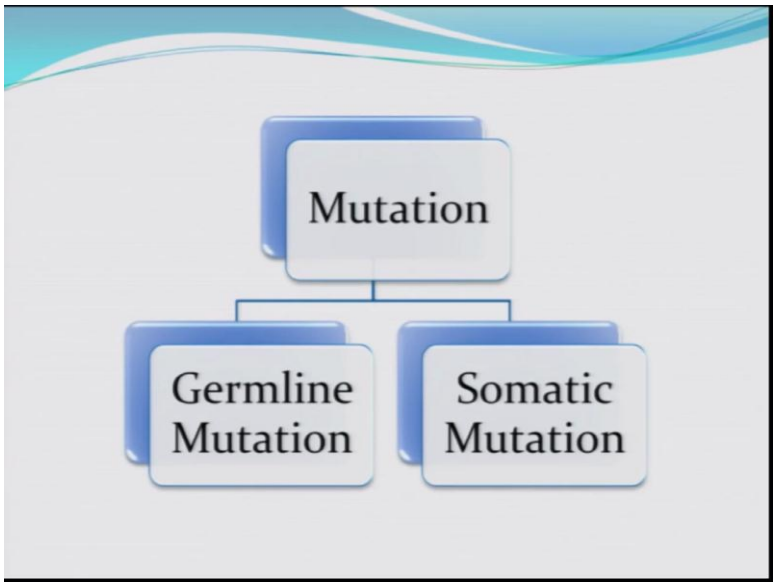

Mutations are of two types the germ line mutation and the somatic mutation.

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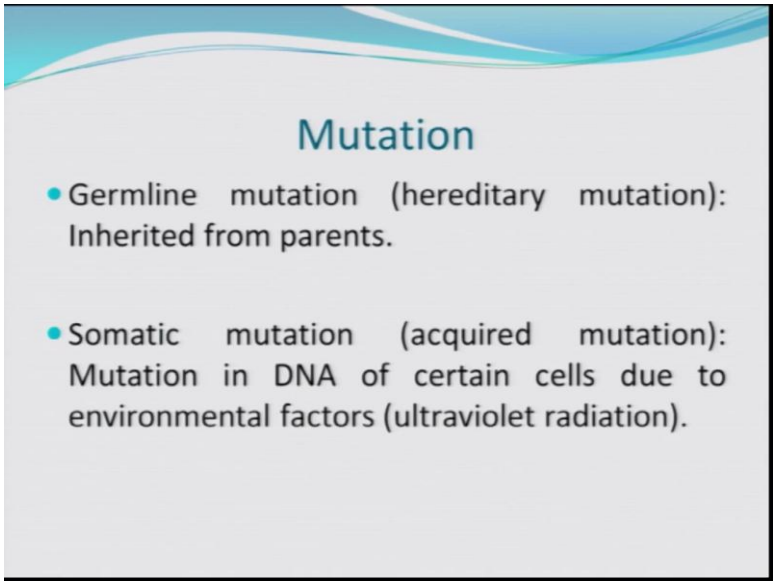

Germ line mutation basically is hereditary mutation. It is inherited from the parents, such type of changes which gets transmitted to the child from their biological parents that is germ line mutation. But if you acquire the change, so if mutation is there in the

DNA of certain cells due to environmental factors say for instance ultraviolet radiation little later we will come to one such example also. If you have change, a mutation which is a consequence of an environmental factor then it is called as somatic mutation.

Although all of us say obvious body parts, none of us exactly look like; so my face is different from yours and yours is different from the third person and even this variation between the human beings that you see it could be either because of mutation germ line or somatic mutation or it could be because of recombination.

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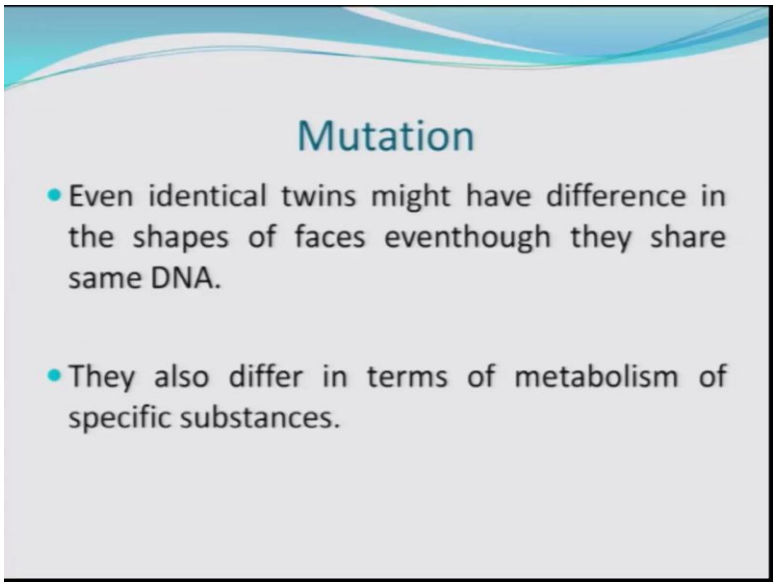

Even identical twins they might have no different in the shape of the face, even though they share same DNA. And they also differ in terms of even metabolism of his specific substances. We will take the example of (Refer Time: 12:03) little later.

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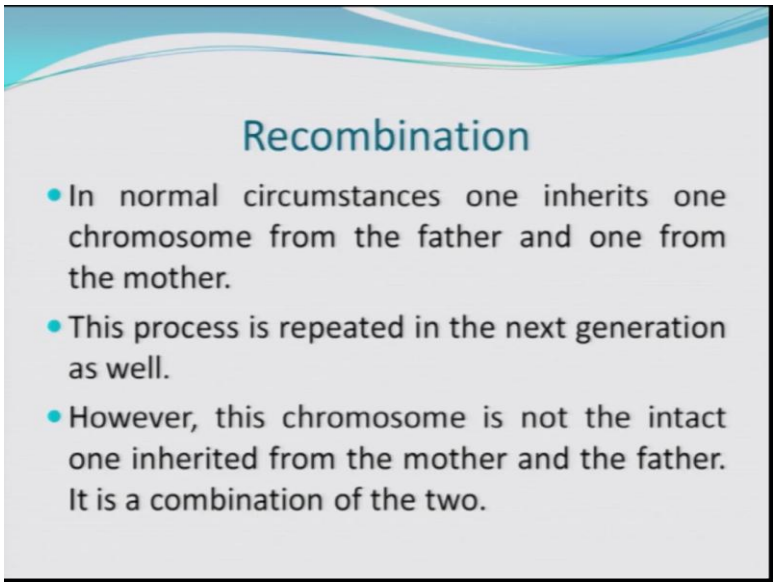

Now let us talk about recombination. Right now we talked about mutation the both the germ line and somatic mutation one that is inherited in nature and other one which is acquired which is a consequence of environment. So, what basically we see here in terms of mutation is that there is a role played by the genetic factor and there is also effective role that is played by the environmental factor. And therefore, both these factors they played their own significant role as far as mutation is concerned.

Now, we are coming to recombination. In normal circumstances one inherits one chromosome from the father and one from the mother. And this process is repeated in the next generation as well. However, this chromosome is not the intact one you inherited from the mother and the father rather it is a combination of the two.

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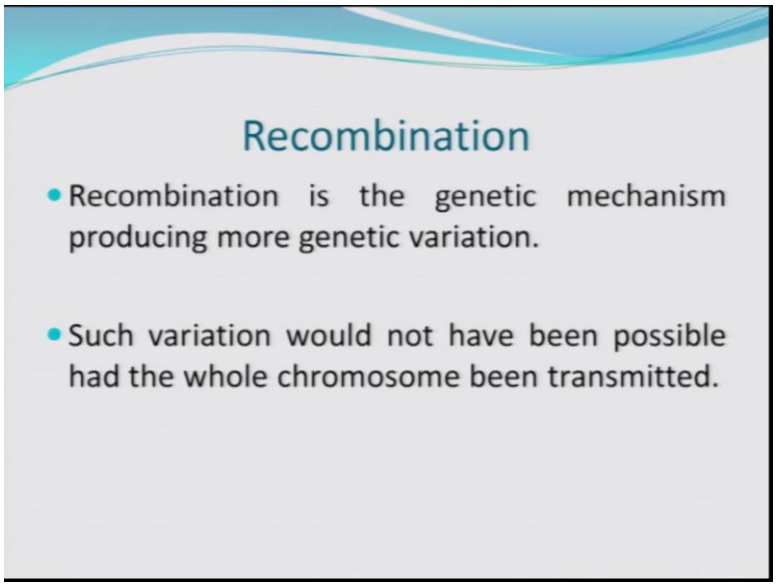

And this recombination is basically the genetic mechanism of producing more and more genetic variation. And such variation would not have been possible had the whole chromosome been transmitted.

So the whole chromosome is not transmitted and therefore it facilitates the process of a genetic variation.

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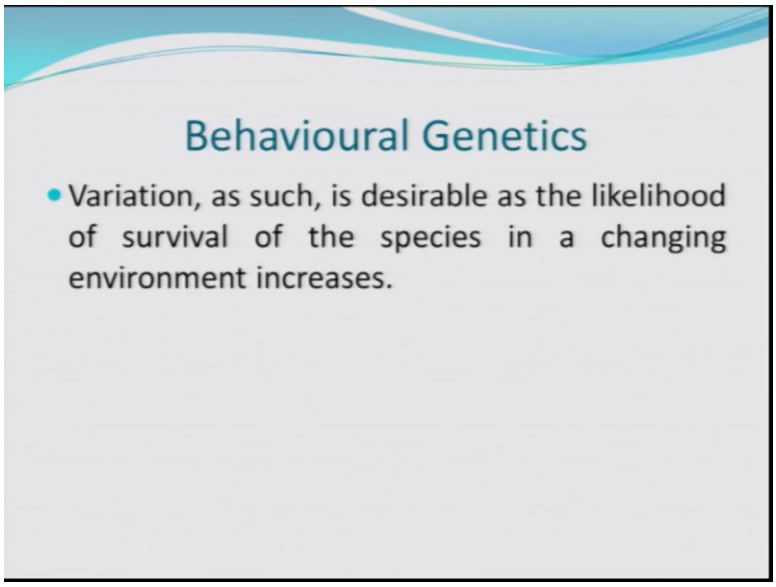

These variations are considered to be desirable. The reason being; that if variation does not take place then what would happen that the likelihood of the survival of any

species would be minimal if there is a change in the environmental circumstance. Now think of various types of environmental changes that take place. You realized at species which have more and more genetic variations they survive.

So, if say we are say some where 10 of us are there and we all are genetically different. And if there is a variation in the environment which makes one of us (Refer Time: 14:03) to that variation at least 9 would survive. And if several such sequences come then also human race will finally succeed surviving, simply because all 10 of us were genetically very different.

So, you can think the number of now variation the type of variations, the extent of variation in the human race and why this is a desirable trait, simply because it allows the human race to survive irrespective of all types of changes that takes place in the environment.

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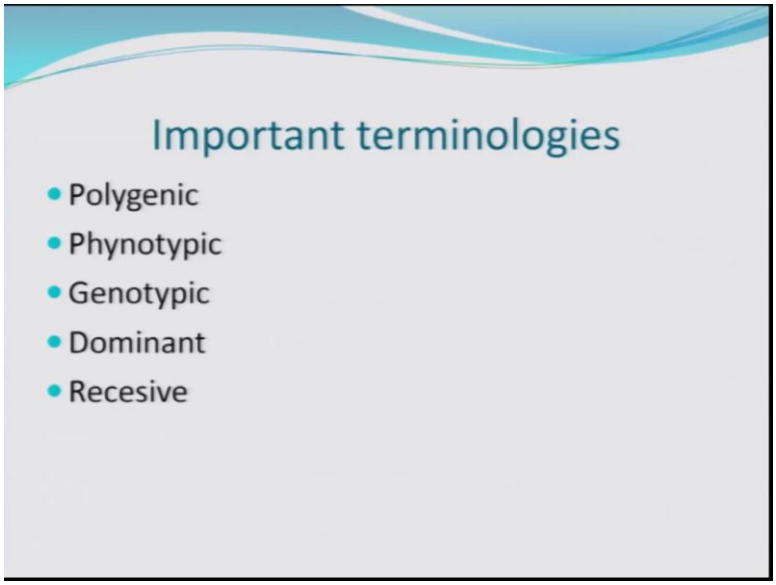

Now, we come to certain important terminologies polygenic, phynotypic, genotypic, dominant and recessive. These are the five terminologies that will first define and then we will talk again about the behavioral genetics.

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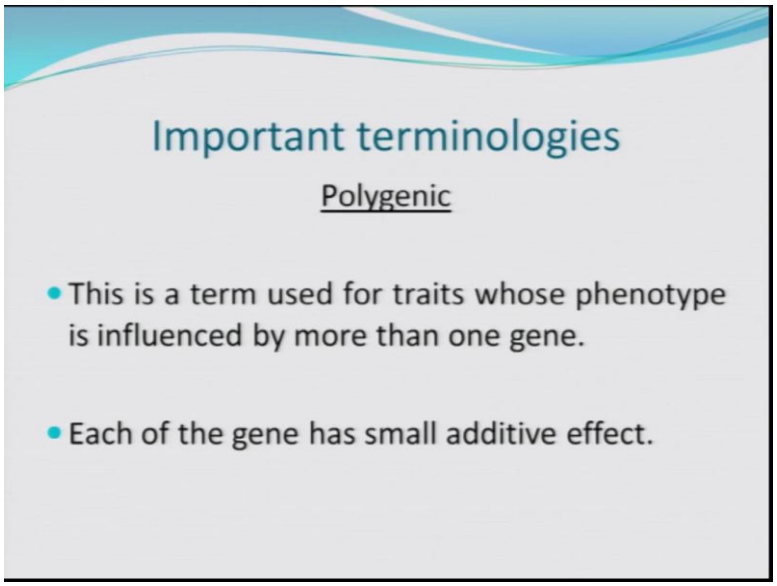

Let us come to polygenic now, this is the term which is used for traits whose phenotype is influenced by more than one gene. So each of the genes has some additive effect, now what is phenotype? We will come little later, but basically the physical appearance for example if you take. Now if the physical appearance is determined by more than one gene where each gene makes some additive effect.

So, if there are 7 separate genes which determines the phenotype that you are looking at and all of them have some incremental effect. So, some total of this 7 genes their effect becomes a particular phenotype and each of them defines one aspect of it. So that is you know Polygenic because it is more than one

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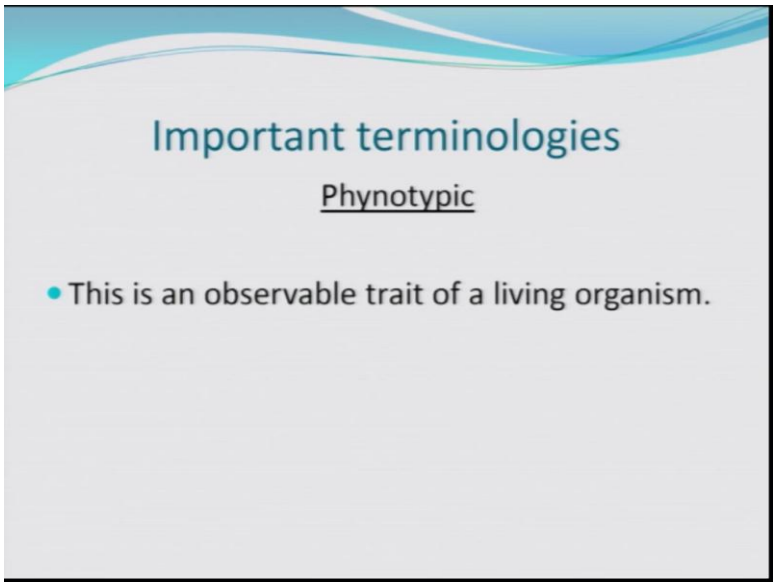

Then we come to phenotypic. This is of course the observable trait, so physical appearance for instance anything that you observe in the living organism; that is the phenotype.

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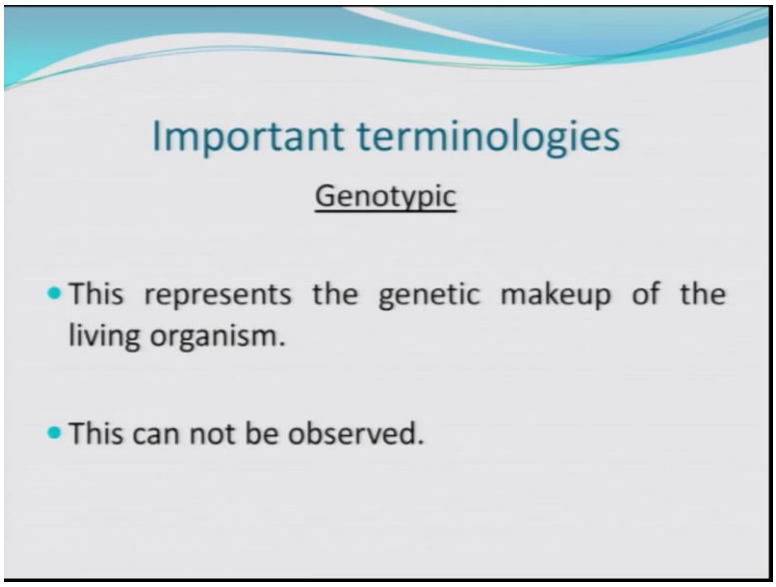

Then we come to the genotype which is the reverse of phenotype. Genotype represents the genetic makeup of the living organism. And because it is genetic makeup here therefore you cannot actually observe it. So, basically it is the biologist who maps your genetic makeup and that genetic makeup tells you why are having a

particular type visible trait and why your children have a different trait which you do not have.

Say for instance, you are a black eyed person the color of the eye ball is black and you realize that one of your child has a brown eye ball. Now that is a variation, overly you think that phenol typically you are black eyed person, whereas there could be possibility that the genetic makeup that you have basically has a recessive character. So the dominant one, right now we will talk about the dominant and the recessive genes also.

But the dominant one gets represented and therefore what you see outwardly the phenotypic trait that is of the black eye ball that we are talking about is not something which actually gets equally represented in your genetic makeup. In your genetic makeup you have a dominant blackness of the eye ball, whereas you are recessive brownness of the eye. And therefore, the child the biological of spring has phenotypic trait which actually represents the recessive character that you are carrying in your gene.

So, there is no always something more too phenotypic trait that is observed to the outer world which is apparent in the genetic makeup. So, genetic makeup has a larger and broader image of what you actually carry besides what you actually look like.

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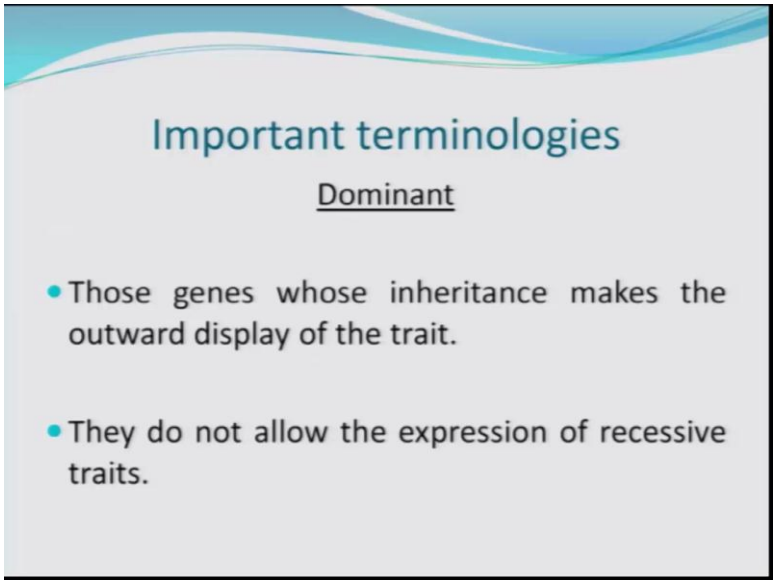

Then we come to the dominant genes. Genes whose inheritance makes the out word display of the trait. Basically, those genes which expressed itself, right now the example that we took say black eye, color of their skin, color of the hair, texture of the hair, all of these are dominant genes. Whereas the genes which do not allow itself to get to expressed completely; basically the dominant gene does not allow them to express those genes are called Recessive Genes.

So, the brownness of the eye ball that we were referring to was the recessive trait that you are carrying your genetic makeup had that. Whereas, the black dominant eye ball was that trait got that got reflected in you and that dominant gene did not allow the recessive one, the brownness to get reflected in you. Recessive genes we have talked about as the name suggest they are basically masked by the dominant gene.

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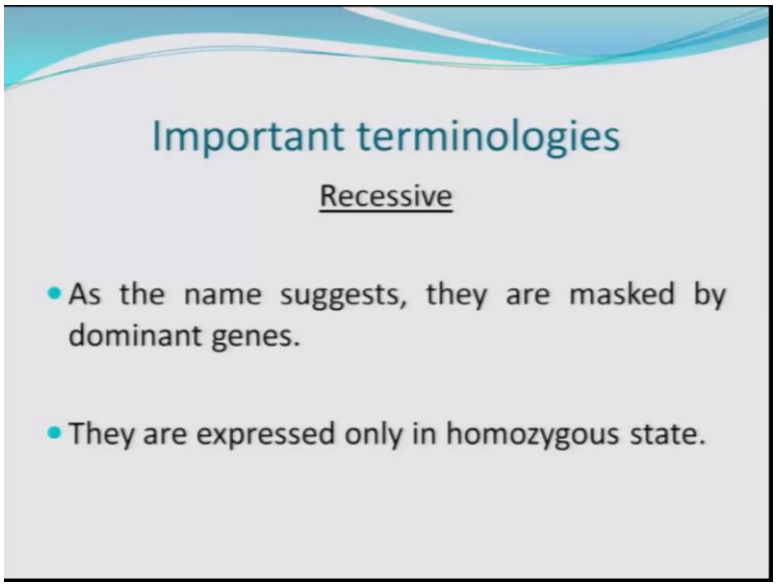

So, they are expressed only in the homozygous state.

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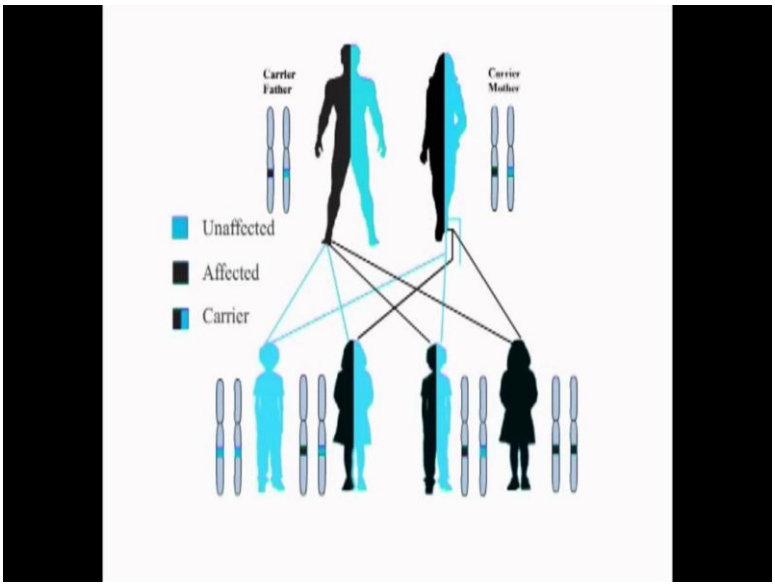

Let us understand genetic inheritance of traits by this example. Here you have the father and the mother who are carriers of a given disease. The blue color represents unaffected individuals, whereas the black color represents individuals affected by the disease. Combination of both the colors represent that the individuals are carrier of the disease. Here, when both the parents are carriers the first off spring is completely unaffected by the disease. The second and the third off spring are carriers where as the forth off spring is affected by the disease.

Now, the big question is to understand the relative contribution of genetic inheritance and environmental determinants of any human behavior. We have seen that we have the dominant genes, we have the recessive genes, we have seen how a combination of genes they affect the behavior in the polygenic state. There is dominant gene that does not allow the expression of a particular trait, but then you also have selective demands that are put forward by the environmental conditions. And for the healthy survival one has to actually show competence that irrespective of the adversity of the environmental condition one can survive.

So, having defined these four-five definitions, and having understood that there is a beauty and there is a biological mechanism of mutation and recombination which makes us look different. Now when we meet next we will be talking about behavioral genetics.