An Answer to the Resemblance

The baby has the mother's eyes but the father's hair color; the nose is like the grandfather's, and the mouth is like the grandmother's. These and other possible combinations are caused by genetic inheritance. The genes transmitted by the father combine with genes in the mother's egg, forming a single cell that will turn into a new human being. Through cell division during the baby's growth inside the uterus, the genes will expand, and the dominant ones will impose themselves over the recessive ones. In the case of twins, the physical resemblance results because they share the same genes.

The Genes

Each human cell (except for a few, such as red blood cells) has a nucleus. Inside the nucleus are the genes, contained in the chromosomes. Each cell nucleus has 46 chromosomes with the person's genetic information. Each gene has information with a code that determines a function in the body, such as hair color. Each living being has its own genetic identification, and the genes ensure that the individual grows and functions in a certain way.

MODEL DNA CHAIN

COMPLEMENTARY DNA CHAIN

DNA STRUCTURE
The DNA molecule consists of two strands that twist around one another and form a double helix. Joining the two strands are four types of nucleotide bases that face each other in a specific and complementary way and provide a cell's instructions.

GUANINE (G)

ADENINE (A)

THYMINE (T)

CYTOSINE (C)

Phosphate group

INSTRUCTIONS
The sequence of the nucleotide bases (adenine, cytosine, guanine, and thymine) determines the message that will be transmitted.

1 DNA Strands

Every strand is made of a sequence of nucleotides. Each nucleotide is composed of a phosphate group, a sugar, and a nitrogenated base.

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GENES ARE CONTAINED IN THE NUCLEUS OF EACH CELL IN THE HUMAN BODY.

2 The Bases

face each other when the strands are lined up opposite one another. Adenine is always matched to thymine and guanine to cytosine.

3 Double helix

The most common structure of DNA, a double helix, is formed from the union of two chains.

Chromosomes

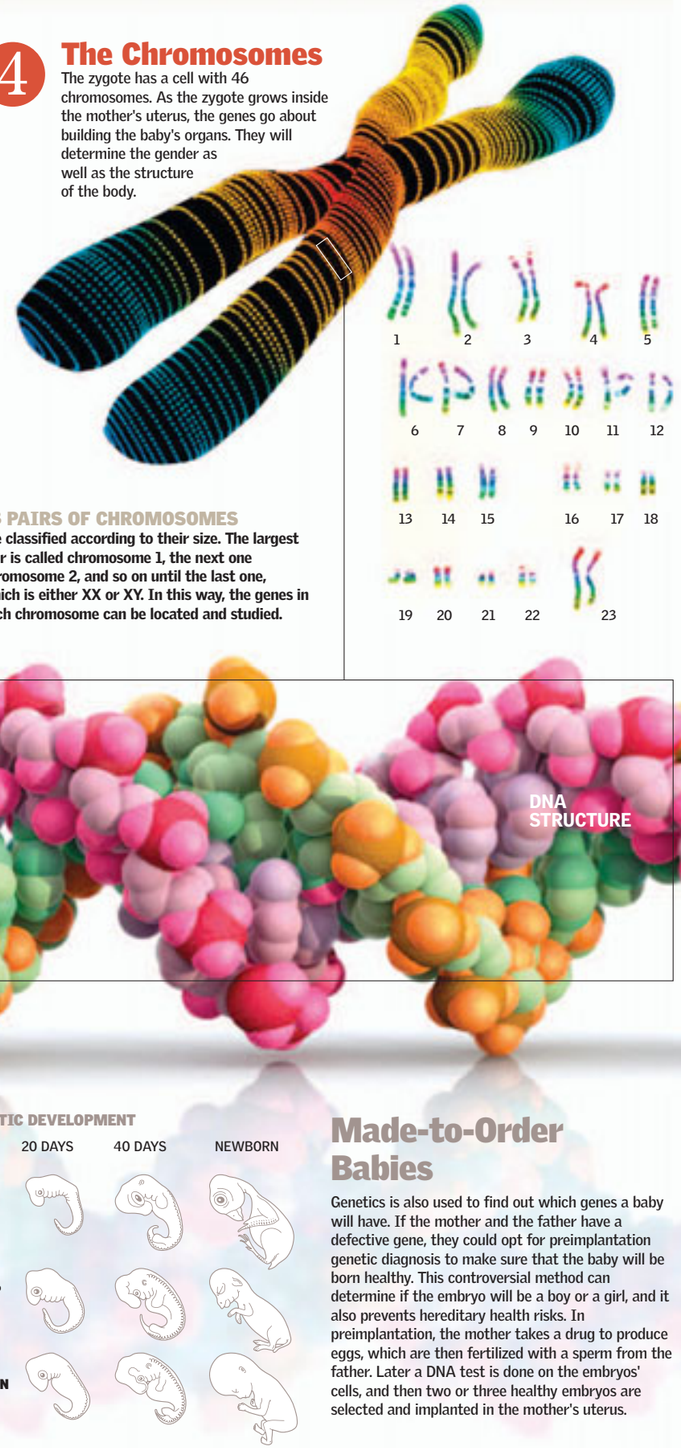
are like long, thin threads, rolled into an X-shape, that contain DNA. The genetic information is stored inside them. Their characteristic shape helps in the transmission of genes to the next generation. Each cell contains a total of 46 chromosomes arranged in 23 pairs. To form gametes, the cell divides twice, resulting in cells with 23 chromosomes instead of 46. When the sex cells join, the cell they create is a zygote, which has the 46 chromosomes necessary to form a human being.

WOMAN
The normal karyotype of women is 46XX.

MAN
The normal karyotype of men is 46XY.

4 The Chromosomes

The zygote has a cell with 46 chromosomes. As the zygote grows inside the mother's uterus, the genes go about building the baby's organs. They will determine the gender as well as the structure of the body.



23 PAIRS OF CHROMOSOMES
are classified according to their size. The largest pair is called chromosome 1, the next one chromosome 2, and so on until the last one, which is either XX or XY. In this way, the genes in each chromosome can be located and studied.

DNA STRUCTURE

Identical and Fraternal Twins

It is estimated that one in 70 childbirths produces either identical (monozygotic) or fraternal (dizygotic) twins. Identical twins have the same genes and therefore are alike and of the same sex. They come from one fertilized egg. In some cases, twins share the placenta. Fraternal twins, on the other hand, are the same in age but not in genetic material. They come from two eggs that are released at the same time and are fertilized by different sperm.

Resemblances

If one observes different vertebrate embryos, the similarities between them are notable. These resemblances reveal that they are all descended from a common ancestor. The development of the body parts is marked by very similar genes. Morphologically all embryos possess a segmented tail, a heart with two cavities, and branchial (gill) clefts. The greatest difference appears in fish, which retain the branchial clefts. In other groups (amphibians, birds, mammals), one of the clefts transforms into the ear canal and the other into the eustachian tube. In spite of the changes in outer appearance, the observable patterns of internal organization tend to be preserved.

GENETIC DEVELOPMENT

Made-to-Order Babies

Genetics is also used to find out which genes a baby will have. If the mother and the father have a defective gene, they could opt for preimplantation genetic diagnosis to make sure that the baby will be born healthy. This controversial method can determine if the embryo will be a boy or a girl, and it also prevents hereditary health risks. In preimplantation, the mother takes a drug to produce eggs, which are then fertilized with a sperm from the father. Later a DNA test is done on the embryos' cells, and then two or three healthy embryos are selected and implanted in the mother's uterus.