

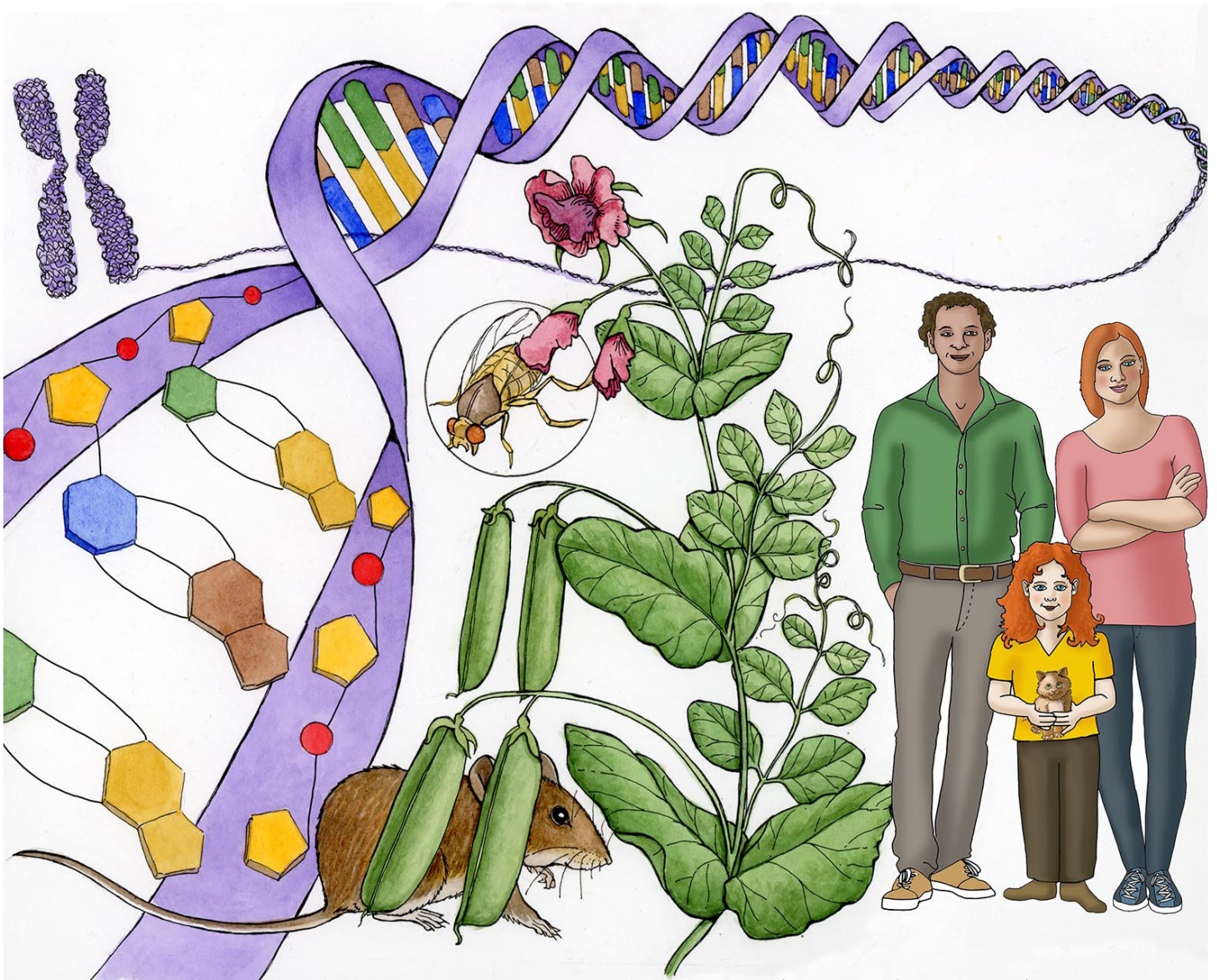
Bundle for Grades 6-8

Resources help clarify the following NGSS Disciplinary Core Ideas:

LS1.B: Growth and Development of Organisms

LS3.A: Inheritance of Traits

LS3.B: Variation of Traits

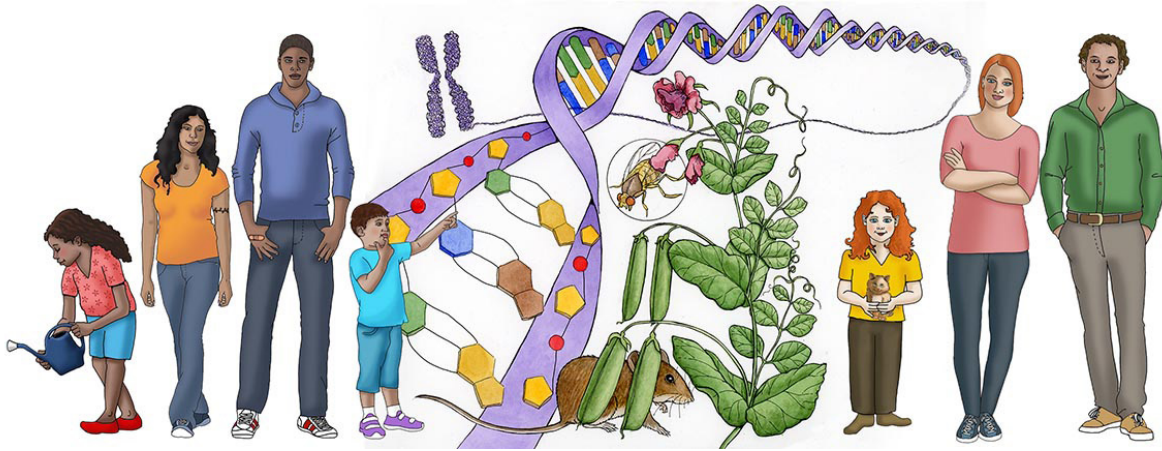


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LS1.B: Growth and Development of Organisms, LS3.A: Inheritance of Traits, LS3.B: Variation of Traits

Grade 6-8

From Heredity - Inheritance of Traits



This bundle includes 21 resources including: Reading, Color Diagrams, Activities, Performance Tasks, and Assessment (39 pages total). Copyright © 2021 Sheri Amsel • All rights reserved by author. Permission to copy for classroom use only. Electronic distribution limited to classroom use only.

Resources included in this Next Generation Science Standards Bundle include:

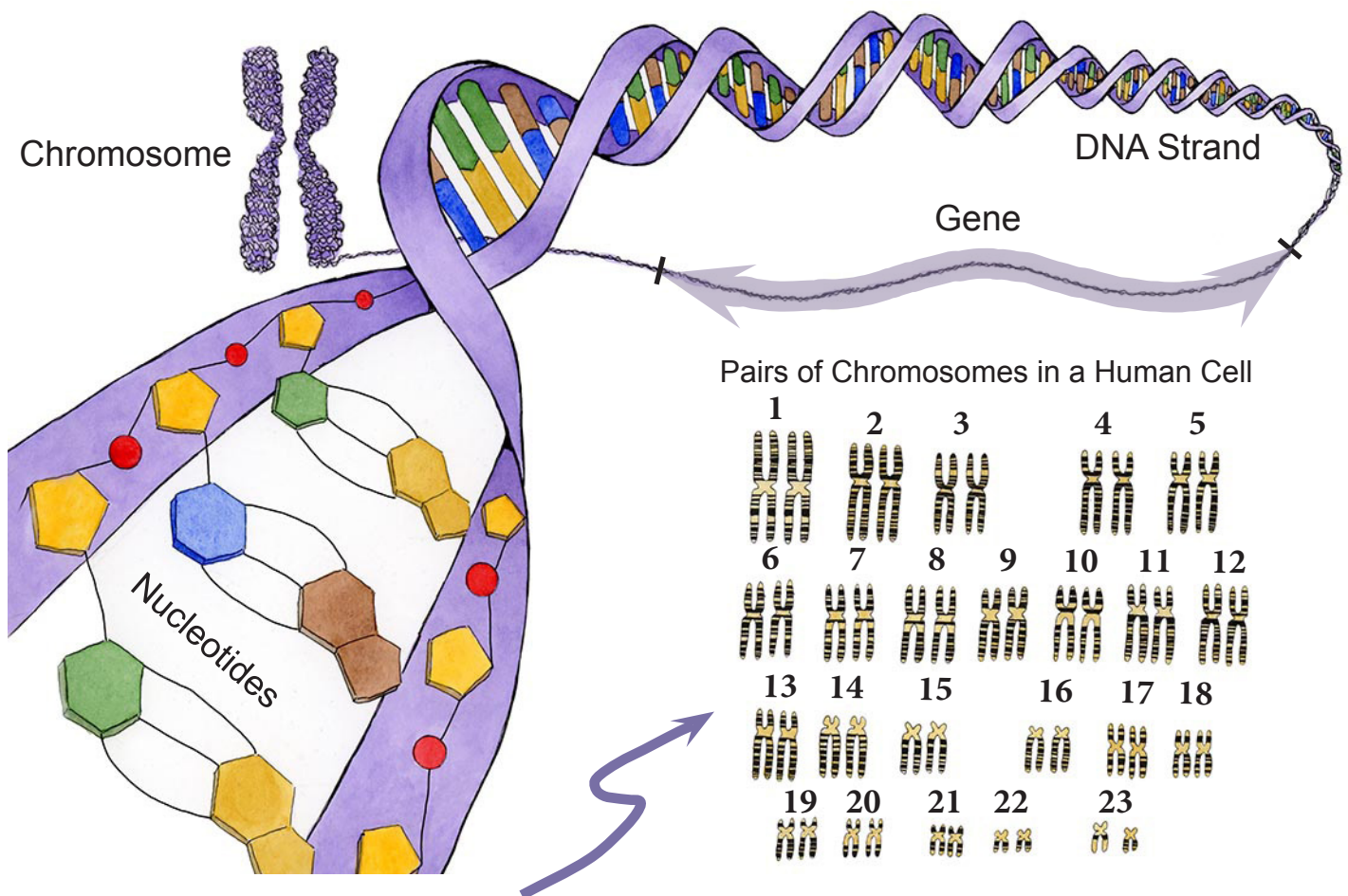
- Heredity: Inheritance and Variation of Traits Next Generation Science Standards (2 pages)
- Rubric Building NGSS Resources (2 pages)
- 1) Where is our DNA and Genes? Reading with Small Diagram (1 page)
- 2) Where is our DNA and Genes? Diagram (1 page)
- 3) Your Chromosomes Reading and Diagram (1 page)
- 4) Inheritance and Variation of Traits Reading (2 page)
- 5) Inheritance and Variation of Traits - Short Answer Quiz with Key (2 pages)
- 6) Inheritance of Traits in Humans - Critical Thinking with Possible Solutions (2 pages)
- 7) Traits and Characteristics - Critical Thinking with Possible Solutions (2 pages)
- 8) Create the Kids Activity Worksheet with Possible Solutions (2 pages)
- 9) Mendelian Genetics Reading (1 page)
- 10) Mendelian Genetics Diagram (1 page)
- 11) Punnett Squares Activity - Pea Plant Genetics with Key (2 pages)
- 12) Variation of Traits in Pea Plants - Matching with Possible Solutions (2 pages)
- 13) Sexual Reproduction vs. Asexual Reproduction Reading and Diagram (1 page)
- 14) Researching Asexual Reproduction - Worksheet with Possible Solutions (2 pages)
- 15) Asexual Reproduction - A Forest of Clones Reading (1 page)
- 16) Sexual vs. Asexual Reproduction Offspring - Punnett Square Activity with Possible Solutions (2 pages)
- 17) How DNA Makes the Organism Diagram (1 page)
- 18) DNA Coding Process - Labeling with Key (2 pages)
- 19) Mutations Reading and Diagram (2 pages)
- 20) Mutations Illustrated Diagram (Model for Describing Structural Changes in Genes) (1 page)
- 21) Mutations - Short Answer Quiz with Key (2 pages)

DNA, Chromosomes, and Genes

The human body is made up of millions of **cells**. Inside each cell are tiny **organelles** that carry out the functions required to sustain an organism's life. The **nucleus** is the organelle that contains our **genetic material** in the form of 23 pairs of **chromosomes** (46 total). Every chromosome is a very long strand of **DNA**.

DNA is made up of tiny molecules called **nucleotides** that are hooked together. Their **sequence** provides the blueprint (code) for building all the **proteins** in the cells. Proteins do not just make up the physical structures in the body. They form **enzymes**, which control and carry out nearly all chemical processes and reactions in the body. So, proteins provide the structures *and* functions the body needs to run smoothly.

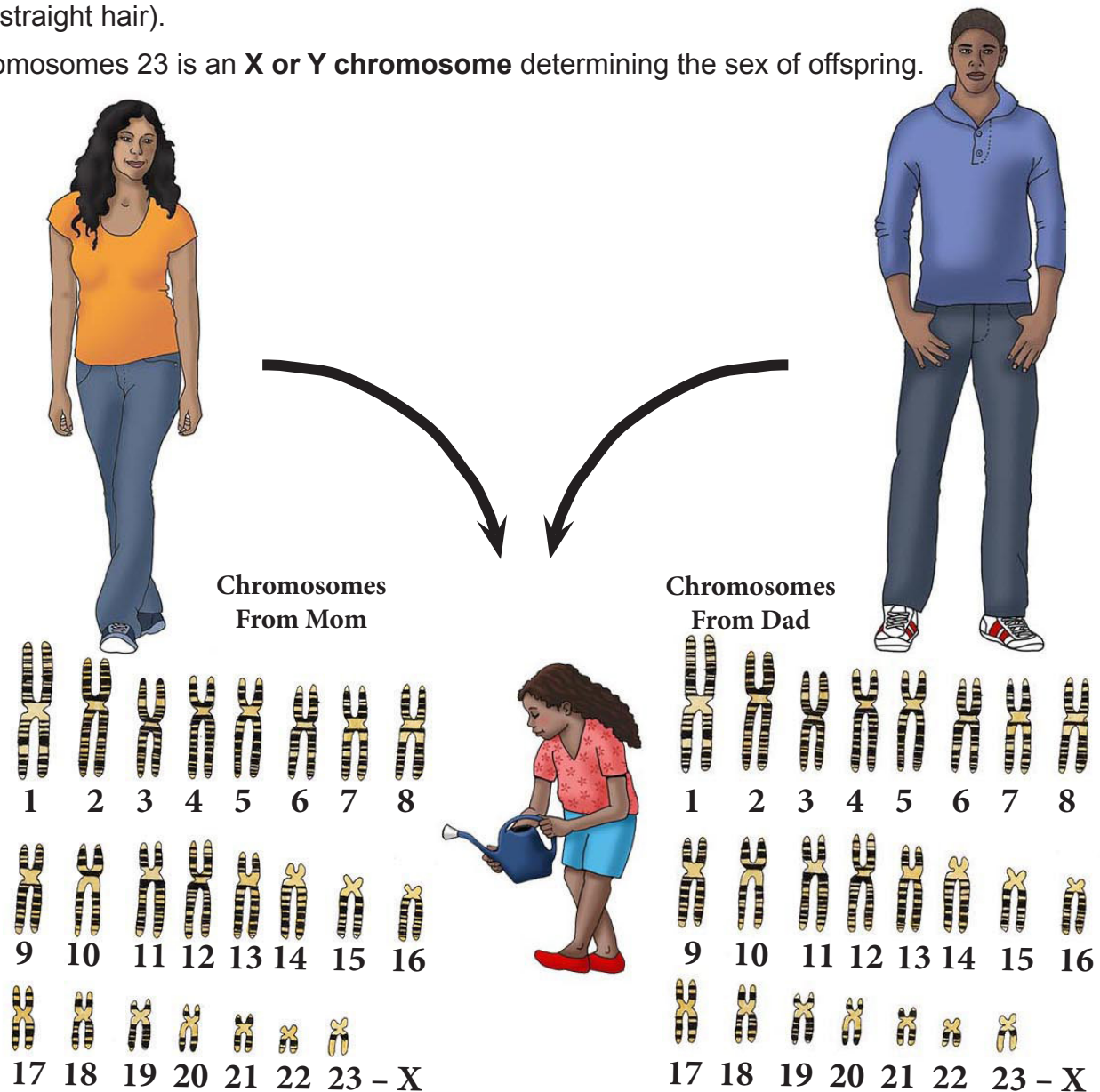
Sections of the **DNA** strand form our **genes** – the basic physical unit of inheritance passed from parents to offspring. Humans have more than 20,000 genes arranged on their chromosomes.



Because we get two sets of **chromosomes** – one set from each parent, it means that we actually have two sets of **genetic instructions** – two variants of each **gene**. These two variants are called **alleles**. Matching alleles are found in the same location on each of the paired chromosomes – one from each parent. The two alleles of any gene may code for the same or different forms of the same trait (e.g. curly hair or straight hair).

Chromosomes and Genes – Facts

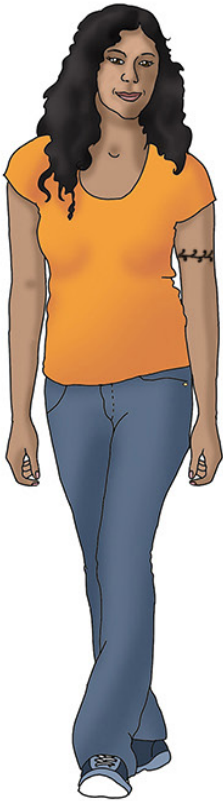
- 1) There are 23 pairs of **chromosomes** found in the **nucleus** of our cells – one set from each parent.
- 2) Each chromosome is made up of one long **DNA** molecule, on which hundreds to thousands of **genes** are arranged.
- 3) **Genes** code for synthesizing **proteins** – which determine our traits.
- 4) Because we get **two sets of chromosomes**, it means that we actually have two sets of genetic instructions – so two genes for each potential trait.
- 5) These **matched genes** are found in the same location on each of the paired chromosomes and are called **alleles**.
- 6) The **two alleles of any gene** may code for the same or different forms of the same trait (e.g. curly hair or straight hair).
- 7) Chromosomes 23 is an **X or Y chromosome** determining the sex of offspring.



LS3.A: Inheritance of Traits – Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.

Traits and Characteristics - Critical Thinking

Make a list of the traits you see in these two people that may be inherited, created by their environment, or both.



Inherited Traits

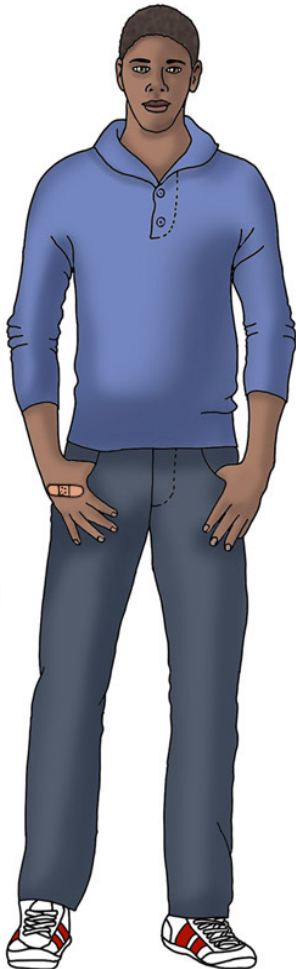
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Traits Affected by the Environment

1. _____
2. _____
3. _____

Traits Inherited and Affected by the Environment

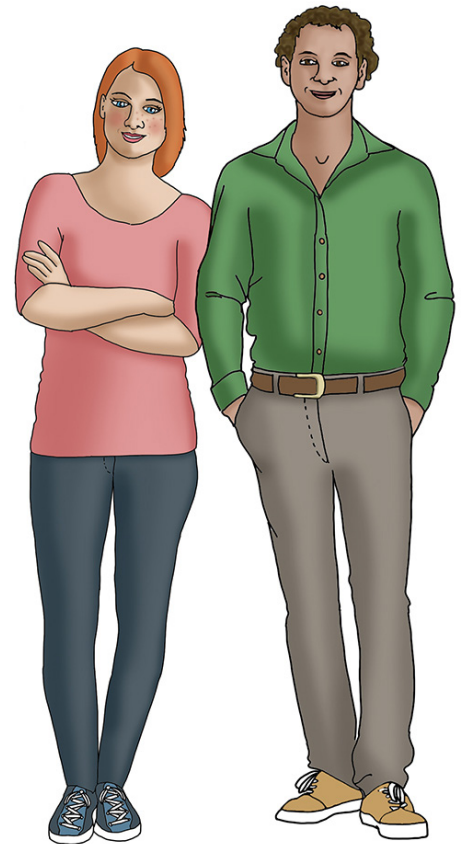
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____



Create the Kids - Genetics Activity Worksheet

Here are the traits that can be passed on by their parents
(Dominant traits are in upper case letters):

Freckled Face = F	Brown Eyes = B	Curly Hair = H
No Freckles = f	Blue Eyes = b	Straight Hair = h



Mom's Phenotype: Dominant freckled face,
Recessive blue eyes, Recessive straight hair.

Dad's Phenotype: Recessive no freckles,
Dominant brown eyes, Dominant curly hair.

Their Genotypes are:

Mom: FF bb hh

Dad: ff BB HH

MOM

Fbh Fbh

fbH		
fbH		

What will their 4 possible kids be?

Use the Punnett Square to map them:

DAD

fbH

fbH

As worked out in the Punnett Square, what are the kid's genotypes? _____

What are the kid's phenotypes? _____

LS3.B: Variation of Traits – In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.

Mendelian Genetics

Gregor Mendel, was a monk in Austria in the mid-1800s who raised peas in the monastery gardens. While breeding his peas, he made some big discoveries about **genetics**. The peas had several **traits** he could see. Some plants were tall and some were short. Some had wrinkled pods and some had smooth pods. Some pods were green and some were yellow. The flowers were white or purple. Mendel looked at each trait and learned how they were passed down to the offspring plants. Since plants breed using pollen, Mendel controlled which plants pollinated other plants. This was how he discovered many important genetic rules.

How an individual looks and what their genetic code is sometimes do not match up. This is the difference between **genotype** and **phenotype**. The genotype is the actual genetic make up of an individual. The phenotype is what that individual looks like.

Traits that show up more often are called **dominant traits**. Traits that show up less often are called **recessive traits**. If an individual with dominant traits breeds with an individual with recessive traits, this can result in **hybrid offspring**. Hybrids can *look* like they have dominant traits (phenotype), but actually be hybrid (genotype). Hybrid plants are different from dominant plants even if they looked the same. Each gene has two chances at a trait – two copies, two **alleles**. So a hybrid plant can be carrying the allele for a recessive trait even if you can't see it. So, a hybrid plant might be tall like its dominant parent, but it still could have an allele for shortness that you don't see. This is the difference between genotype and phenotype. The genotype is the actual genetic make up of an individual. The phenotype is what that individual looks like. This can be illustrated with a simple chart called a **Punnett Square** using the example of tall pea plants versus short pea plants. When two hybrid plants breed, one in four of the offspring are short. This is a **3:1 ratio**.

Punnett Square shows the two alleles of each parent plant crossed with each other and the 4 possible resulting offspring.

**T = tall, t = short, TT = dominant tall,
tt = recessive short, Tt = mixed hybrid**

In this Punnett Square both parents are mixed hybrids.
Offspring are a **3:1 ratio** tall to short.

	T	t
T	TT	Tt
t	Tt	tt

How DNA Works

DNA makes **messenger RNA (mRNA)**, which makes **proteins**, which makes up the structures and functionality of organisms. This is achieved by three processes that convert DNA's information (code) into protein molecules: **replication**, **transcription** and **translation**. (This is called the **Central Dogma of Genetics**.)

