The **Life Science** of Creation

Studying God's World (Science)

in the Light of God's Word (Scripture)

Mr. Galloway

Chapter Three

Genetics

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DNA =

© **D**esigned **N**ot **A**ccidental

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Information
Always originates
From Intelligence

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Candy Cane Cornsnake

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A Snake is made of:
Protons, Neutrons, Electrons formed and functioning according to the information coding designed into its DNA by the Designer / Creator God.

A Metal Telephone Pole is also made of protons, neutrons & electron, yet not alive since it has no BIO-INFO

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The Sections in Chapter 3

3.1 Mendel's Work
3.2 Probability and Genetics
3.3 The Cell and Inheritance
3.4 The DNA Connection

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3.1 Mendel's Work

Gregor Mendel = Father of Genetics
* He experimented with pea plants.

- **Traits** = different physical characteristics (tall, short, green or yellow)
- **Heredity** = the passing of traits from parents to offspring

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Labeling Generations: P, F1, F2

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Purebred

always produces offspring with the same form of a trait as the parent

* Crossed purebred tall with purebred short.

* **P** Generation = parental generation

* **F1** Generation = first filial (son) generation

* All of F1 generation were tall.

* Then he bred the F1 to F1 and the F2 were a mixture of traits (tall and short)

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Genes = factors that control traits. (Example: plant height)

Alleles = different forms of a gene. (Examples: tall or short)
* **Dominant** allele = one whose trait always shows up if it is in the genes.
* **Recessive** allele = is masked or covered up, if a dominant allele is in the genes.

Tall is dominant in pea plants, so a plant with one short and one tall allele, will be a tall plant.

-Purebreds have two identical alleles (either tall/tall, or short/short).

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Hybrids = have two different alleles for a trait (tall / short).

•When **hybrids** (**F1**) are crossed (**tall/short**) X (**tall/short**), some of the offspring were (tall/tall), and others were (tall/short), and some were (short/short).

Symbols in Genetics:

* **Capital** letter = dominant (**T = tall**)

* **Lowercase** letter = recessive (**t = short**)

TT = purebred with two dominant alleles (tall plant)
tt = purebred with two recessive alleles (short plant)
Tt = hybrid with one dominant and one recessive (tall plant)

Google research charts of Mendel's pea traits:

Google: Punnett Squares

Section 3-2 Probability and Genetics

- **Principles of Probability**
  - Tossing a coin = 1 in 2 chance of "heads".
  - Each of the two possible events is equally likely.
- **Mendel and Probability**
  - He was the first to recognize probability principles can be used to predict the results of genetic crosses.
  - If he crossed two hybrids (Tt) x (Tt) = three fourths Tall, so probability for tall plants = 3 in 4.

Punnett Squares

- **Punnett Square** = a **chart** showing all the possible combinations of alleles that can result from a genetic cross.
  - Geneticists use these charts to show all the possible outcomes of a genetic cross and to determine the probability of a particular outcome.
- **Predicting Probabilities –**
  - Example of crossing a black guinea pig and a white guinea.
  - So the P Generation (parental generation) is BB x bb (purebred Black x purebred white)
  - B = Black (dominant) b = white (recessive)

Punnett Square Charting

Crossing BB x bb

	B	B
b	Bb	Bb
b	Bb	Bb

F1 Generation Offspring (First Filial Generation) 100% of them are black

Crossing Bb x Bb

	B	b
B	BB	Bb
b	Bb	bb

F2 Generation Offspring (Second Filial Generation) 75% are black, and 25% are white

	B	B
b	Bb	Bb
b	Bb	Bb

= 4 black (100 %)
= zero white
= zero purebred
= 4 hybrids

	B	b
B	BB	Bb
b	Bb	bb

= 3 black 75%
= 1 white (bb) 25%
= 2 purebred (BB, bb) 50%
= 2 hybrids (Bb, Bb) 50%

Combinations

- **Phenotype** = physical appearance (visible traits)
  - Tall or short is a an example of phenotype
- **Genotype** = its genetic makeup (allele combination)
  - Tt and TT are examples of a genotype for tall.
- **Homozygous** = organism with two identical alleles (TT) or (tt) at a gene site.
  - Purebred
- **Heterozygous** = organism with two different alleles (Tt) at a gene site.
  - Hybrid

Codominance

- **Codominance** = the alleles are neither dominant or recessive.
  - So, both alleles are expressed in the offspring
  - A hybrid with have a mixture of the alleles, not just one over the other.
  - Symbols for codominant alleles are special
  - Example of chicken feather color
- (F^B = black feathers) (F^W = white feathers)

Section 3-3 The Cell and Inheritance

- Dr. **Sutton**, a geneticist, 1903 compared grasshopper sex cells and body cells.
  - Body cells have 24 chromosomes, but their sex cells have only 12 chromosomes (exactly half)
  - Sutton wanted to see how they were formed.
  - **Sperm** = male sex cell (12 chromosomes)
  - **Egg** = female sex cell (12 chromosomes)
  - So a new baby grasshopper gets 12 from each parent = 24 total

- **Chromosome Theory of Inheritance** = genes are carried from parents to their offspring on chromosomes.
- **Meiosis** = the process by which the number of chromosomes is reduced by half to form sex cells (sperm and eggs).
  - **Punnett Squares** show what happens during meiosis to separate the alleles in each parent, and then combine them to form offspring.

- **Chromosomes** – Humans have 46 (23 from each parent)
  - Over 20-25,000 genes together on these 23 pairs of chromosomes.
- **Comparing Mitosis and Meiosis:**
  - **Mitosis** = 1 body cell divides into 2 body cells with the same number of chromosomes.
  - **Meiosis** = 1 body cell divides into 4 sex cells, with half the chromosomes of a body cell.

Google - Body Cell Cycle Diagrams: Interphase, MITOSIS, Cytokinesis

Google – Sex Cell Division: MEIOSIS

Section 3-4 The DNA Connection

- The Morse Code uses two symbols to code information (dots and dashes)
- Computer codes use two numbers to do it (0's and 1's) (000011100111)

The Genetic Code

- **The Genetic Code:** uses four nitrogen bases (molecules) along a gene to form a code, that specifies (tells) which kind of protein will be produced for the cell.
  - A group of three bases codes for the attachment of a specific amino acid.
  - These are like three letter code words.
  - The order of the bases determines the order of amino acids put together to form a protein.

Protein Production (Protein Synthesis)

- The cell uses information from a gene on a chromosome to produce a specific protein.
- Messenger RNA (mRNA) copies the coded message from the DNA in the nucleus, and carries the message to ribosomes in the cytoplasm.
- Protein synthesis takes place on the ribosomes in the cytoplasm.
- Transfer RNA (tRNA) carries amino acids to the ribosomes.
- The tRNA and mRNA matchup and this links the amino acids into a chain to form a protein.

Mutations

- is any change (error) that occurs in a gene or chromosome.
- If an A mistakenly replaces a G, this would be a mutation.
- Mutations cause incorrect proteins to be formed.
- So, the phenotype (trait) will show up different and even destructive.
- Mutations in body cells will only affect that cell that carries it.
- If mutations occur in sex cells, it can be passed on to offspring and show up in the offspring's phenotype.
- Another mutation error occurs if chromosomes don't separate correctly during meiosis, and so the offspring has too many or too few chromosomes.
- Some mutations are harmful, some are beneficial, and some have no effect.

Google – DNA structure
Adenine, Thymine, Guanine, Cytosine

Google Images – DNA Replication

Google Images –Protein Structure