

PART 1 SPONTANEOUS GENERATION 1850AD - 2000AD

Before 1861

Anyone can observe that after it rains earth worms appear on the surface of the soil. Prior to 1861 it was commonly believed that the right conditions of rain, soil, sun and enough time, somehow generated worms. Their idea can be summarised as a formula:

Soil + Rain + Sun + 1 Day → Worms

Others had observed that if meat was left somewhere warm for a week, it became full of maggots which turned into flies. Their conclusion was:

Meat + Heat + 1 Week → Flies

Other people thought that mice spontaneously appeared from wheat when the right conditions occurred.

Such ideas had the common theme that the right starting materials, eg soil and water, could turn into living things if energy, such as sunlight, was added, with the right amount of time (one day to obtain worms from soil, to three weeks for mice to grow from wheat). Because such mice or worms were thought to appear suddenly without obvious parents, this idea became known as **Spontaneous Generation**.

This idea can also be summarised as a formula:

Matter (M) + Energy (E) + Time (T) → Life (L)

This formula can be abbreviated by the symbols:

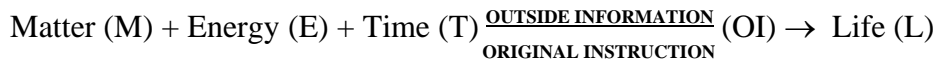
M + E + T → L

Looking back from the Space Age, it is easy to say that people who believed such an idea must have been a bit short on intellect. But adherents of such ideas included intellectual giants such as Isaac Newton who pioneered calculus and enabled us to understand many of the laws of physics. Isaac Newton and many other scientists of the day were not fools, so how could they believe in **Spontaneous Generation**?

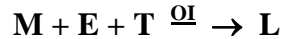
Prior to the mid nineteenth century most scientists also believed the first living things were created by God as described in the Bible's account in Genesis. Many who accepted **Spontaneous Generation** argued that Genesis Chapter 1 Verse 11 states that God commanded the ground to bring forth plants, therefore it was possible some of God's original instructions for creating living things may have been "left" in the dirt. Therefore they believed, when the right conditions of matter, energy and time occurred, the presence of original instructions, would spontaneously produce life.

Because the original instructions came from the Creator God, they were not a natural property of any created matter, energy or time. Such **Outside Information (OI)** was supplied to the system by God.

For this reason, a more correct formula for their idea of the **Spontaneous Generation** of life would be:



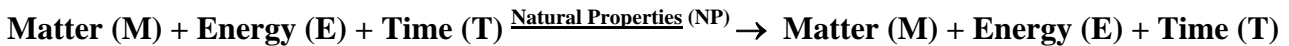
A shorthand version would now read



PASTEUR'S PROBLEM

Louis Pasteur was a French scientist whose name has become a household word. It is on every carton of milk which has undergone a process called pasteurisation, which basically kills all living organisms in the milk so it does not go sour or cause us to get ill. Pasteurisation is one side benefit from Pasteur's famous 1861 experiment to test whether life could be **Spontaneously Generated**.

In his experiments, Pasteur eliminated all life from a nutrient rich soup and showed that if you killed all life in the soup no new life formed. **Spontaneous Generation** did not occur. Louis Pasteur's experiments proved that if all you have are the **Natural Properties (NP)** of non living Matter plus Energy and Time, you will produce only non living Matter, Energy and Time. This could be summarised as:



Louis Pasteur established beyond a shadow of a doubt that:

- (a) **Spontaneous Generation** is impossible under present conditions
- (b) There are no **Original Instructions** or **Outside Information** left in the environment from the time of Creation.

Spontaneous Generation was dead, but...

Around the time Pasteur was proving **Spontaneous Generation** could not occur in the present world, another man was proposing an idea which would eventually be shown to depend on Spontaneous Generation having occurred sometime in the past. In 1859, **Charles Darwin** made popular the idea which would become known as **Evolution**. It was not a new idea - but Darwin explained it in a way that was acceptable to many influential thinkers of his time.

Darwin was a gifted amateur naturalist whose formal education was in training to be an Anglican Clergyman. However, he never worked as a minister in a church. He had a private income and was able to spend his life in a personal study of living creatures. He wrote many books detailing his observations of many types of living things ranging from barnacles to orchids. His theory claimed all living things had a common ancestor and had slowly changed from one form into another due to **Natural Processes** alone. Although Charles Darwin wrote much about **Natural Processes** changing one life form into another, he did not seriously address the problem of how life arose in the first place. Darwin left the origin of life open to the possibility of a Divine Creation.

Pasteur was amongst the first to realise Darwin's theory would lead to a new version of **spontaneous Generation** where life appeared purely as a result of the **Natural Properties** of matter, energy and time. Because of this Pasteur became a public opponent of Charles Darwin.

Since the 1860's, Darwin's theory has been expanded and modified by many others. In its current form, the **General Evolutionary Theory** can be summarised with the statement: *present life forms arose by natural changes to previous life forms, which evolved from the first life form, which arose spontaneously from non living matter.*

Sidestepping Pasteur

By the early 1900's we had the curious situation where all scientists accepted that Pasteur had proven spontaneous generation could not occur via natural processes in the world today, yet Darwin's idea of evolution by natural processes was becoming more popular. In most people's minds was the notion that an Intelligent Creator could be called upon to explain the origin of life, then Darwin's evolutionary processes would explain how the different life forms have arisen since. But such an explanation was not acceptable to proponents of the rapidly rising ideology of Communism. In 1917 the Communists of the Russian Revolution set up a state whose official religion was Atheism, ie there is no God, so there could not have been any creation. Life must be accounted for by purely Natural Processes since all that was (and is) available was Matter, Time and Energy.

In 1924 a leading scientist of Soviet Russia, Alexander Oparin suggested that organic (carbon containing) molecules existed on earth before life arose and these somehow joined together to form living cells. Oparin thus claimed life originated by a new version of **Spontaneous Generation** due to the **Natural Properties** of the universe. To avoid Pasteur's explanation that Spontaneous Generation is impossible under present circumstances, Oparin, an ardent atheist and communist, suggested the world's environment was somehow different in the past. Oparin's formula for life would be:

Matter + Energy + Time Natural Properties → **Life**

or **M + E + T** ^{NP} → **L**

Oparin's idea of organic molecules forming spontaneously under different environmental conditions, then joining together to eventually form living things, was taken up by American scientist Harold Urey. He proposed that the earth once had an atmosphere of methane, ammonia and hydrogen, but no oxygen. Urey's idea was known as the "primitive earth hypothesis."

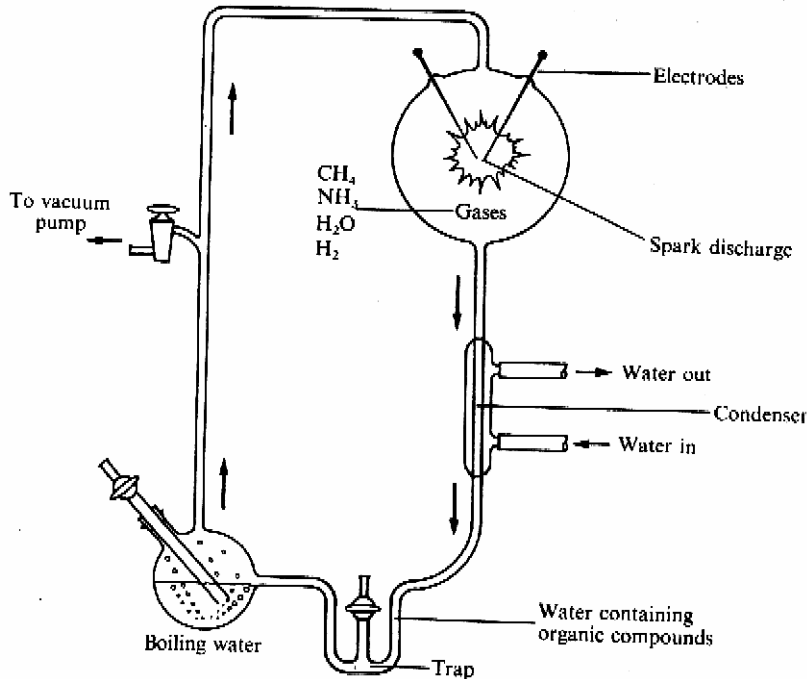
Spontaneous Amino Acids

In 1953 Stanley Miller, who was working in Urey's laboratory, set up an experiment to test the theory that the **Natural Properties** of simple compounds such as methane and ammonia, reacting under the conditions proposed in Urey's "primitive earth", would lead to the formation of biological molecules. He set up the apparatus illustrated on the next page.

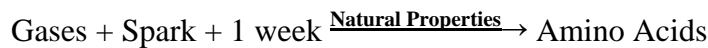
The methods and results of Miller's experiment are summarised by the author of one 1990's high school biology textbook: *"Miller sterilised the equipment to kill all micro-organisms, excluded all traces of oxygen, and simulated lightning by generating sparks between tungsten electrodes. Incredibly, within a week the raw materials of life assembled themselves like enchanted building blocks, creating the ordered structures of amino acids - the building blocks of proteins - where before there had been only chaos."* (Reference: Levine & Miller, *Biology*, 1991, page 270)

Miller duplicated the “primitive atmosphere” by placing gases, such as methane, hydrogen and ammonia, along with water, in his apparatus. No oxygen was allowed to enter the tubing and the water was constantly heated and a spark constantly discharged through the circulating gas. After one week, the clear mixture had turned red. Testing showed amino acids were now present in the solution.

Miller's apparatus



The results of Miller's **Natural Properties** experiment could be summarised with the formula:



or generally $\text{Matter} + \text{Energy} + \text{Time} \xrightarrow{\text{Natural Properties}} \text{Amino Acids}$

or in shorthand $M + E + T \xrightarrow{NP} AA$

Since amino acids are linked together in the proteins of living organisms, the proponents of this new theory of **Spontaneous Generation** argued it was surely only a small step from Miller's amino acid results to the formation of proteins, ie:



Therefore, the next hypothetical step from protein to living cells must have somehow readily occurred. ie

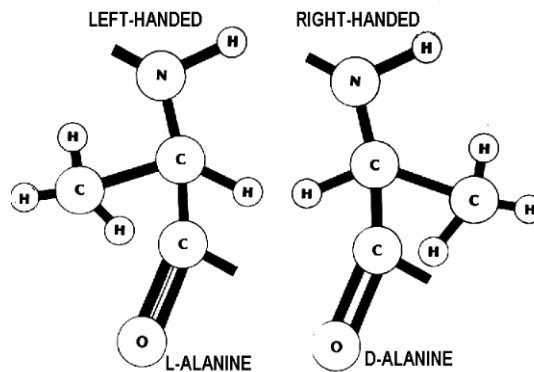


As a result many concluded that Miller's experiment had established that life could have originated by processes which involved only the **Natural Properties** of the solar/earth system. No outside information from a Creator was needed.

These logical steps sound reasonable, but one natural property of amino acids poses a problem.

Right and Left Handed Molecules

The atoms which make up each amino acid molecule (except glycine) can be assembled in two slightly differing molecular shapes. These have become known as right and left handed molecules because of their similarity to human hands. Each hand has the same components, organised in the same way, ie. one thumb on the side and four fingers. We could write a formula for a hand as T_1F_4 and this would be equally valid for each hand. However your two hands are not exactly the same. Try putting a right hand into a left glove. You cannot substitute a right hand for a left hand. Hold your right hand up to a mirror and then compare the reflection in the mirror to your left hand. Your two hands are mirror images of one another. Amino acids have this same property. Each amino acid has two mirror image forms which have been called right handed and left handed. The simplest amino acid which shows this, is **Alanine**.



Miller's **Natural Properties** experiment, produced solutions containing approximately 50% right handed and 50% left handed amino acid molecules.

BUT!

Amino acids found in the proteins of living cells are 100% left handed, so we must ask this question. *If only the natural properties of the environment are at work, could a mixture of 50% right and 50% left handed amino acids give rise to living cells whose proteins are made up of 100% left handed amino acids? Could the left handed ones be naturally separated from the right handed?* To investigate these questions we must examine another natural property of amino acids.

When a solution containing only left handed amino acids is left alone the amino acids slowly alter until the solution becomes approximately 50/50 right and left handed mixture. This breakdown is a **Natural Property** of the system.

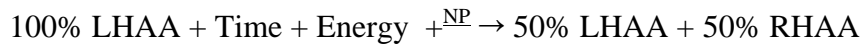
Molecules During Life

In living organisms there are certain substances containing proteins which are laid down outside living cells and not replaced throughout life, eg the liquid gel (vitreous humor) in the eyeball and the hard dentine inside teeth. These materials are effectively "non-living" as they are no longer part of a living cell. Once laid down they become subject to natural processes. It has been observed that as a creature ages a small percentage of the left handed amino acids in these materials change to right handed forms. This process happens slowly but in a long lived organism such as a whale or a human being a measurable amount of right handed amino acids develops in these extracellular substances by the time these creatures reach old age. Because the internal environment of the body is constant throughout life, the ages of both whales and people can be estimated by measuring the percentage of right handed amino acids in eyes and teeth. Right handed amino acids are only found in living things in such deposits.

Molecules After Death

After an organism dies all of its amino acids, inside and outside of cells become subject to this change. If a creature's proteins, made of only left handed amino acids, are preserved, they gradually change into a mixture of left and right handed molecules. The time it takes any protein's 100% left handed amino acids to alter to 50% right handed amino acids varies with the type of amino acid and with environmental conditions, so this method does not always provide an accurate clock for dating dead things. However, given enough time such a process will continue until there is approximately an even mixture of the two forms.

The effect of Natural Processes (NP) on left handed amino acids can be summarised:



The same behavior occurs if you start with 100% right handed amino acids. It eventually becomes a 50/50 mixture. Considering that all life forms contain only one form of the amino acids, and that a 50/50 LH:RH mixture of amino acids is as dead as you can get, Miller's experiment (which produced the 50/50 mix) simulated death - not life!

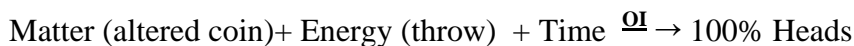
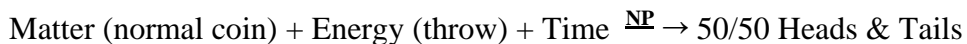
Heads or Tails

Further insight comes from examining the **Natural Properties** of objects which, like amino acids, have 50/50 characteristics. A coin has two distinct sides, usually called *heads* and *tails*. When you throw a coin it can land either head up or tail up. Each time you throw it you have a 50% chance of getting a head and 50% chance of a tail. It is also a fact that if you were to throw a coin once every minute for a week, and count the number of heads and tails the result is an almost even number of each, ie approx 50% heads, 50% tails.

Can you throw 100% heads?

This result can be obtained if you interfere with the coin, eg make a two headed coin or weight one side. The two headed coin will always land heads up. A coin weighted on one side will tend to land with the other side up. Such interference (usually called cheating) means you are no longer relying on the **Natural Properties** of the coin. You have deliberately manipulated the system and supplied **Outside Information** that wasn't a **Natural Property** of the original system.

We could summarise the results of coin tossing under the influence of **Natural Properties** (NP) compared with a coin manipulated by **Outside Information** (OI) as:



When the Fraud Squad investigates a 'crooked' gambling casino, they know someone is meddling with a gambling game when the results are not those predicted by the **Natural Properties** of the game. They are looking for the influence of added **Outside Information** on the gambling games and they arrest the person adding it. It takes added **Outside Information** to ensure 100% heads when the **Natural Properties** of coins would have given 50/50 results from coin tossing. Does this apply to amino acids?

Back to Pasteur

Pasteur was the scientist who discovered the existence of left and right handed organic molecules while studying substances called **tartrates** in grape juice. In 1847 he had observed that tartrate crystals had two slightly different shapes. He carefully separated the two shapes by painstakingly picking out each crystal with a pair of tweezers. He then dissolved the two types of crystals in separate solutions and found that one solution twisted polarised light to the right and one twisted it to the left. This is the reason he named these molecules **right handed (RH) or left handed (LH)**.

We could summarise Pasteur's experiments with left and right handed tartrates as:

Matter (**50/50 tartrates**) + Energy + Time $\xrightarrow{\text{OI(Pasteur)}}$ 100% **LH tartrate** + 100% **RH tartrate**

Pasteur was deliberately manipulating the tartrate system from outside so he was applying **Outside Information** to the system. Scientists have since developed other methods of separating mixtures of right and left handed organic molecules into pure right or left handed molecules. Every method found to date has required manipulation of the system by supplying **Outside Information**. Therefore we can make Pasteur's tartrate formula more general:

50/50 mixed Matter + Energy + Time $\xrightarrow{\text{OI}}$ **100% LH Matter** + **100% RH Matter**

The Big Picture

Let's review what has been learnt about amino acids and their natural properties.

1. Miller's experiment of sparking a mixture of simple gas molecules in conditions where natural properties prevailed resulted in an approximately 50/50 mixture of left and right handed amino acids.
2. Amino acids in the proteins of living things are 100% left handed.
3. If 100% left handed (or 100% right handed) amino acids are left in conditions where only natural properties prevail they will eventually form an approximately 50/50 mixture of left and right handed molecules.
4. After death the amino acids of organisms will eventually form an approximately 50/50 mixture.
5. In order to obtain 100% left or 100% right handed molecules from a 50/50 RH/LH mixture, **Outside Information** must be supplied to manipulate the system, as in Pasteur's tartrate experiment.
6. The above points could be summarised in formulae as:

$$100\% \text{ LHAA} + \text{Energy} + \text{Time} \xrightarrow{\text{NP}} 50/50 \text{ AA}$$

$$50/50 \text{ AA} + \text{Energy} + \text{Time} \xrightarrow{\text{OI}} 100\% \text{ LHAA}$$

CONCLUSION

Since the proteins of living organisms contain only left handed amino acids, which have the **Natural Property** of spontaneously producing 50/50 left & right handed mixtures. Since a mixture of left handed and right handed amino acids cannot spontaneously produce pure amino acids, proteins in living organisms cannot be the result of a spontaneous reaction of amino acids resulting from any properties of the Natural system.

Spontaneous Generation of proteins? No. But...

By 1994 scientists had abandoned trying to explain the origin of life in terms of proteins formed on a “primitive earth” from amino acids such as those simulated by Miller and others. An article in Time magazine October 11, 1994 summarises their opinions:

“And although Miller’s famous experiment produced the components of proteins, more and more researchers believe that a genetic master molecule - probably RNA - arose before proteins did.” (p71).... “It was”, says planetary scientist and White House Fellow, Christopher Chyba, “a beautiful picture.” “Unfortunately”, he adds, “it is probably wrong.” (p73)

Why choose a molecule such as RNA to arise before protein? Because research has shown that the **Outside Information** needed to build proteins from amino acids in living organisms is supplied by a molecule named **Ribonucleic Acid** or **RNA**. The RNA contains coded instructions which it carries from the cell nucleus to the site where proteins are made. What this theory suggests is that somehow RNA was spontaneously generated and became the “information” organiser which enabled living things to evolve.

COMING IN PART 2

To investigate this we will research the question - “If the relatively simple molecules such as amino acids cannot spontaneously generate proteins, could a molecule such as RNA which is far more complex than proteins and amino acids, spontaneously come into existence due to the influence of the **Natural Properties** of the system?” Eating some long dead sardines will help us find the answer.

NOW COMPLETE WORKBOOK 1 BEFORE COMMENCING PART 2.