



Scientific Creativity Exhibition
"Abiogenesis"
Catalogue
2010

Scientific Creativity Exhibition

“Abiogenesis”

Shenton College

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Musical DNA

Paper, keyboard

The idea for translating genetic coding into music was appealing to me, I have played music from a young age and it has been done numerous times, as shown by the many examples on the internet. I had always planned to translate the sequence from a protein or amino acid, but at the beginning of the project I hadn't realised how many there were, so I had planned to translate as many as I could into music. After just one day of research, I realised how hard it would be to find the genetic sequence for, and then translate so many different codes, so I decided to narrow it down to just the one code. The whole time I had been testing my translation index, I believe I should call it, on the sequence that had been provided by Gary Cass in one of the various booklets. At one point I noticed that part of the description of the sequence mentioned that the source of the code was uncultured *Cyanobacterium*, 16S ribosomal DNA, from the bottom of an acidic mine pit lake in Brandenburg, Germany. Upon asking why it was from an acidic mine in Germany, I was told that it was a modern example of ancient DNA of sorts, what we were using as a comparison for other 16S ribosomal DNA, and that by comparing the two sequences, it was possible to tell how far removed modern day DNA is from what it used to be, through mistakes caused by evolution. Because us humans are what we call "the most evolutionally advanced" species at this particular moment in time, I began to think that it would be interesting to convert both the human and the *cyanobacteria's* 16S ribosomal DNA to music and to compare the two musically.

Musical DNA
By Alex Castleden

DNA - uncultured cyanobacterium - 16S Ribosomal RNA gene
- what is now used to determine interspecies relationships as it is thought to be the closest modern representative of the original DNA.
- compare with Human 16S Ribosomal RNA
Shows mt. development - "most advanced species"
Or not

AA: A	A: d one beat
AC: B	C: d two beats
AG: C	G: d three beats
AT: D	T: D four beats

CA: Sharp #
CC: Flat ♭
GG: mp. (quieter)
CT: mf. (louder)
CE: E
CG: F
CG: G
CT: — (one beat rest)
TA: Sharp two notes ^
TC: Sharp octaves ∩
TS: Half notes ▭
TT: Double stop two notes ▯

Kimberley Lamev, Lahra Edwards, Stephanie Lamev & Rebecca Turner

Abiogenesis-*a crystal dance*

Our art piece uses body movement to convey our ideas responding to the theory of Abiogenesis.

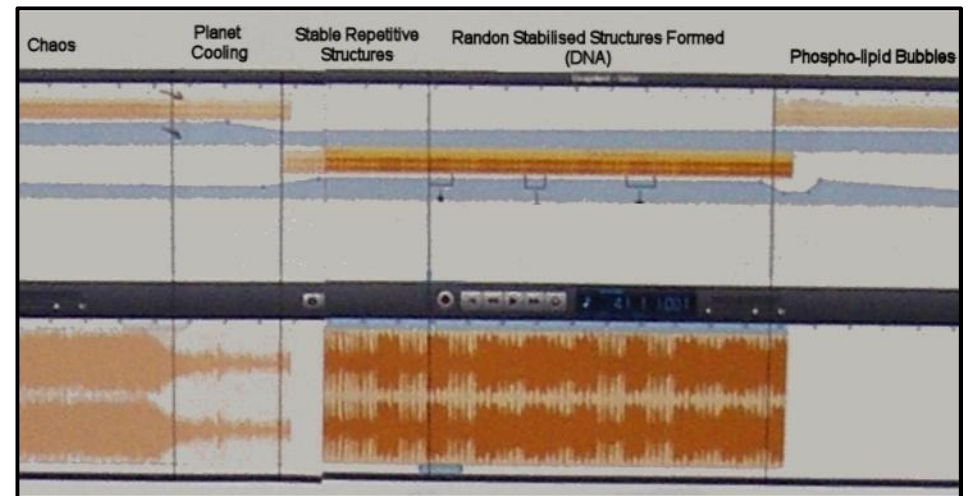
It begins in a world of extreme atmospheric conditions, as fire and ice fight for dominance over the world leaving it an intense 200°C in the sun and -200°C in the shade. We symbolised the two extremes with the levels we use to symbolise a power relationship between hot and cold, when one was strong the other was inferior and pushed into a small space low on the ground.

An unknown power source then set about a huge change in environment causing the world to be thrown into chaos the earth became a molten ball of lava. This section is resembled by the four forces pulsing in unison and then exploding in a whirl followed by fast, aggressive movements.

Over the next few hundred years the planet cooled to that of a similar climate to today. There is a noticeable change in our movements which become fluid as we 'melt' towards the floor and then slide into position (as the continental plates moved) It was within this climate that repetitive stable structures (crystals) began to form. Mutation within the development of the crystals lead to the formation of randomised stable structures (DNA) and the beginnings of life. To signify this notion our actions became robotic and exaggerated. We each did the same movement to being with and then each made as error or 'mutated' until we were all dancing differently.

At this time the crystals began to form a special kind of bubble with a phospho-lipid layer. These bubbles had hydrophilic heads attracting water and hydrophobic tails repelling it. This enabled a lining of fat to support a mass of water. These bubbles became the first cell membrane, named a micelle. We each came together as moved around in a circle as if attracted to each other, then we break apart and slide away from each other on the floor, this represents the repelling nature of the tails.

The DNA entered the bubbles forming the first living cell which is when we each connect at the finale of the crystal dance.



Daena Ho

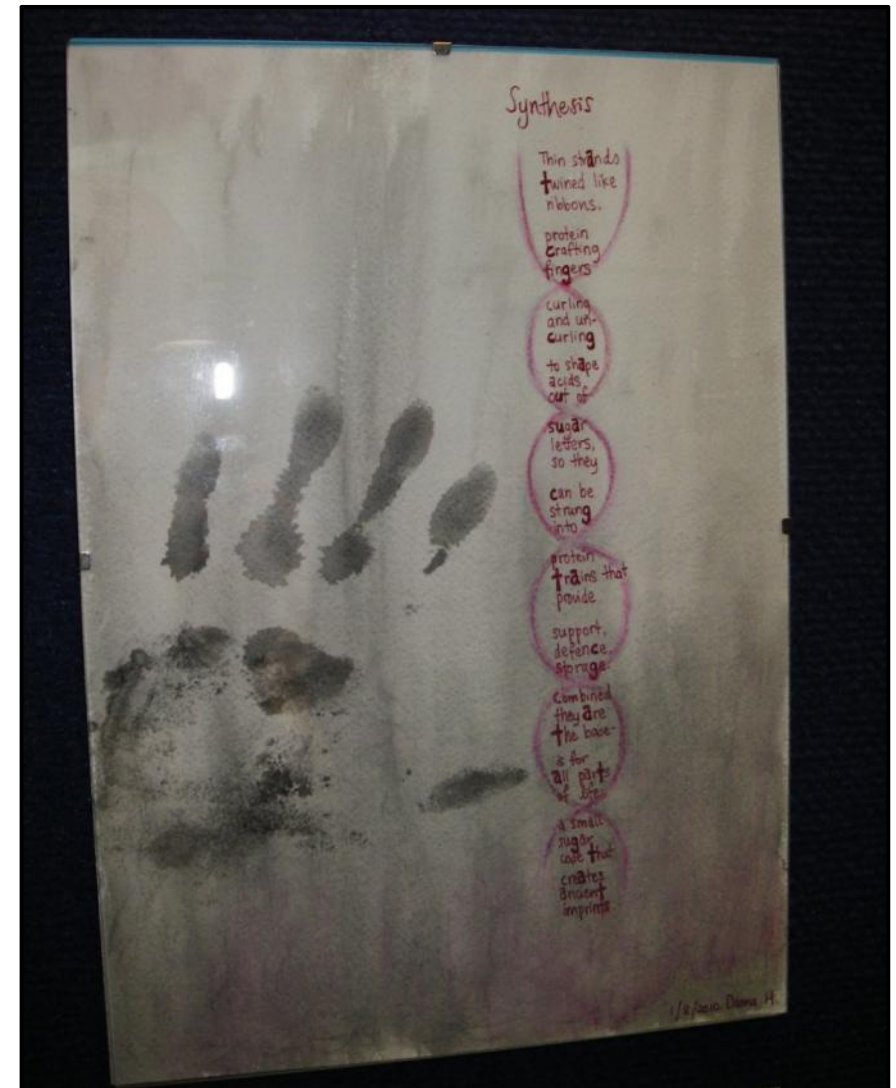
Synthesis

Watercolours, ink

Deoxyribonucleic acid (DNA) is the foundation of all forms of life. In the synthesis of protein, three nucleotide bases combine with a complimentary base triplet to form an amino acid, which in turn form proteins. I seek to represent this process through the structure of the poem, using one syllable to represent each nucleotide base. Hence, each stanza of the poem corresponds to one amino acid, and the entire 'string' of the poem is symbolic of a protein molecule.

Within each stanza are a pair of letters that represent the base pair used in the manufacture of proteins: Thymine and Adenine, Cytosine and Guanine, as well as Adenine and Uracil, a base found within ribonucleic acid (RNA) that is used in place of Thymine. These highlighted letters are a stylised representation of each syllable as a nucleotide base.

Altogether, the poem both explores and symbolises the process of protein synthesis. Synthesis is also the bringing together of ideas to form a whole, which is exactly what happens in living organisms. It is the coming together of cells and tissues and organs and systems that make up the organism. In the same vein, it is the coming together of the ideas of how to carry out certain body functions (stored in DNA) that make up all organisms.



Daena Ho and Chloe Giffard

Living Poetry

Non-pathogenic E. Coli, agar plates, Petri dishes, 50x50 mirror, cardboard boxes

Using poetry we reflect on the key concepts covered throughout this course. This project seeks to use nature as a way to reflect on science. In this project we explore the concept of autopoiesis, when an organism is self-maintaining, autonomous and self-repeating. Autopoiesis literally translates to 'self-poetry' or 'self-making', and that's exactly what we're trying to represent here.

We've adopted the standard scientific tools (Petri dishes, bacteria) to consider how life has been generated and continues to flourish on Earth. From repetitive stable crystal structures to random stable DNA strands, from trapped gas bubbles to fledgling cells, scientists have recorded and speculated at life's resilience. Now we've used bacteria to bring some of these scientific ideas to 'life'. The mirror juxtaposes bacteria with human life to convey a biological then-and-now, while the cardboard boxes in different shapes and sizes show the diversity of life on Earth.



Devid Ferri

'Life: Luck or a Mathematical Plan?'

Computer

Is life one big coincidence or is it the mathematical plan of an entity's work? This PowerPoint Presentation will explore just few of the aspects about life here on Earth and the possibility of life in the cosmos, and how mathematics is used to show that this may or may not be a coincidental phenomenon.

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots, \quad -\infty < x < \infty$$

$$(1+x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \dots$$

Life: Luck or a Mathematical Plan?

By Devid Ferri

$$(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right) \quad (x+a)^n = \sum_{k=0}^n \binom{n}{k} x^k a^{n-k}$$

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Life in Numbers

- The Earth is roughly 4.5 billions years old, and first began to support life forms 3.7 billion years ago
- Plant life began on Earth roughly 430 millions yeas ago
- Earth should last for a further 7.5 billion years before our sun becomes a red giant star, thus destroying the planet
- 5 to 100 million of unique species of plants and animals currently live on Earth, however only 2 million have been identified so far
- Mammals make up 5400 of these species, insects 950000 and plants about 300000
- DNA was first discovered in 1869 by Swiss physician Friedrich Miescher

Veronica Light

'Coated in Bubbles'

Laboratory coat, food dye, bubble mix, cooking oil

The coat was covered in bubbles that popped and stained the lab coat. Most of the images formed on the coat resemble bubbles that have a hydrophobic outside layer, so in relation to the process of Abiogenesis when the bubble is coated in lipids it is hydrophobic on both the inside and the outside. This is now the basic form of a cell.

I easily could have done this on a piece of paper or on a canvas sheet, yet the reason I used a lab coat for the art piece to be presented on is so that it can tie the two worlds of Science and Art together so that they work in harmony with each other.

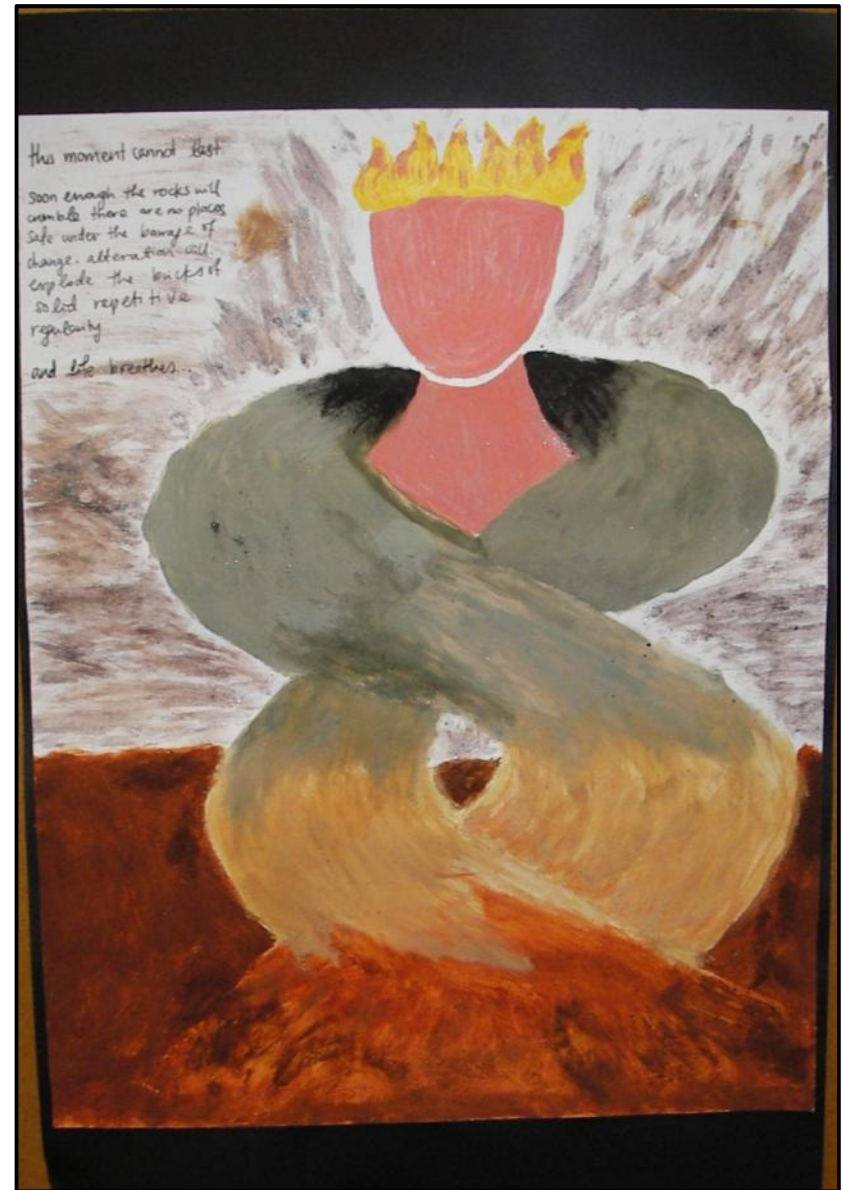


**Alex Castleden, Chloe Giffard, Daena Ho, Veronica Light,
Amy McAlpine.**

'From the Earth, We Live'

Rocks, glue, water, acrylic paint

Before there was life on the Earth the planet was mainly made up of rocks that followed a constant molecular pattern. Over time the solid rock was affected by a change which continued over time to create DNA. From this DNA organisms emerged. Time slowly went on as green plants developed and animals began to walk. From this slow process humans were formed. Within a few short years of human's existence we have begun to destroy it and so we wear a crown of flames.



Amy McAlpine

Life is Just Peaches and Cream

Fruit puree, plastic tubing, wood

Our DNA contains the instructions that specify for every part of us and make us who we are. It codes for every breath and every heart beat, and is the source of all life. But what makes up our DNA? Nitrogen, sugars, phosphates, all things that we obtain from food. Food, the basis of all life, giving us nutrients and energy, all the things we couldn't live without. So if life is from DNA and DNA is essentially from food, then is life literally just peaches and cream?

