
**Chantal:** Welcome everyone to the first The Science Circle presentation of this season facilitated by Vic Michalak.

When Jes and I requested the SC to offer us a lecture for the upcoming months… we didn't expect the result shown to you in the calendar.
It is diverse, even a few new fields, new SC members who will present... all and all we think an interesting mix for 2013.

If you didn't receive the Science Circle Calendar IM me, we are all familiar with SL.
This lecture will be recorded and placed on our website as PDF.
Photos taken here can show up on our
Website http://sciencecircle.org/
LinkedIn http://www.linkedin.com/company/science-circle
or the Facebook page of SC https://www.facebook.com/groups/155012474522202/

For his lecture "DNA Gene Expression and Telecommunications" Vic will use Voice and Chat… use group IM if you need help enabling voice.
Wishes everyone an interesting hour!
(Leaves the stage to Vic)

**CB Axel:** ☺ αρρℓαυsε ☺
**StJohn Noyes:** yes
**CB Axel:** I hear you
**Nat Ure:** I hear
**Mr Geo Somerset:** yes I can hear you
**Chantal:** Yes ☺
**Paolo Rousselot:** sounds great!
**ἀρετή:** hears ya fine
**Turnex Morellet** raises hand

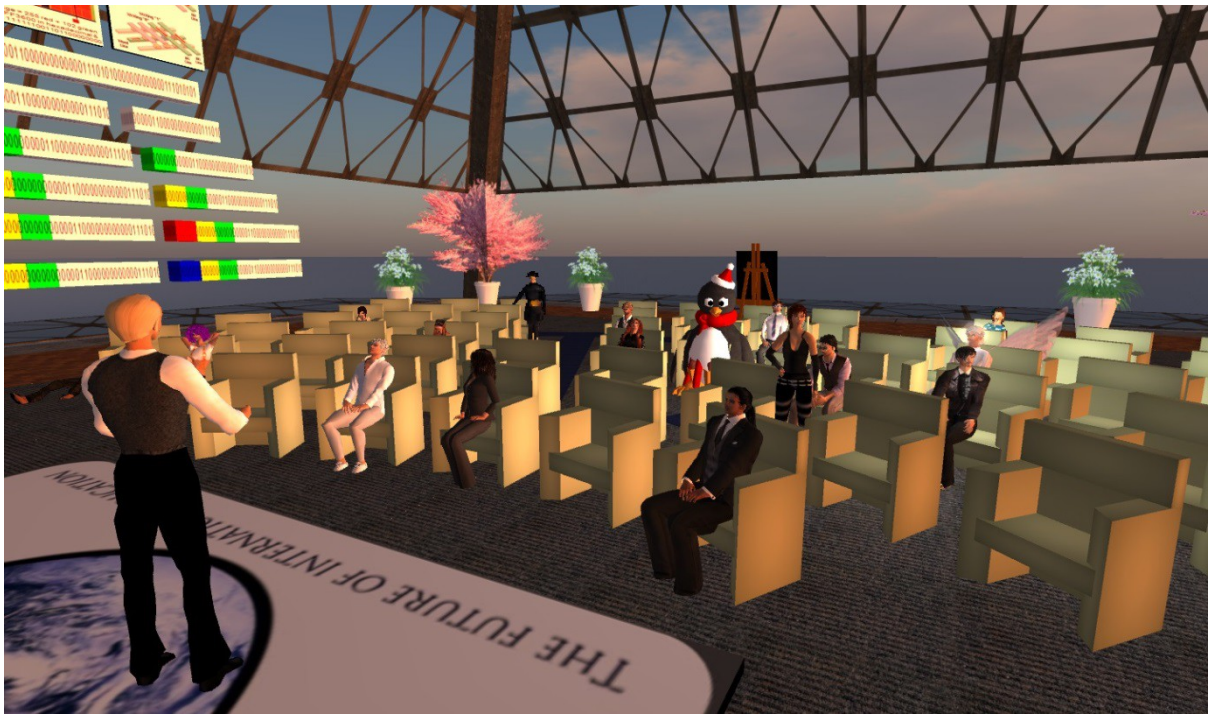
**Stephen Xootfly:** : )


**Vic Michalak:** Welcome to The Science Circle! We started informal discussions in Second Life as early as 2007 and became formal presentations and discussions in March 2008.
Today we are on STEM Island. It is owned by the Computer Information Systems (CIS) Program at my university. I am the Department Head. We are delighted to be hosting Science Circle presentations.
Here is a list of the upcoming presentations by The Science Circle. Chantal and Jes have worked hard to bring you a great line-up of presentations! Be sure to view the website to learn more: http://sciencecircle.org

**Paolo Rousselot:** we're delighted you're delighted!
**ⓆⓊⒶⒺⓏⒶⓇ:** ツ
**Chantal:** YAY ツ
**Lyr Lobo** grins

**Vic Michalak:** I will be speaking in voice and publishing text to the general Chat area. Please feel free to comment or ask questions at any time. I will try to answer you then or wait until a bit later.
The way DNA codes instructions to create proteins and the way humans code instructions to send messages by computer have some startling similarities that are fun to explore.
Proteins are essential to life.
They form the scaffolding of cell components and participate in the cell's functions.
All proteins are composed of sequences of fewer than two dozen amino acids that create their 3D structures and enable what they do.
DNA contains only four types of units which pair up in different patterns to create the critical instructions that make the cell work.
Vic Michalak: The four units are called nucleic acids and they are Adenine + Thymine (they always pair together) and Cytosine + Guanine (the other pair).

The instructions found in DNA are stored carefully as DNA is folded very tightly in a cell as the top diagram shows.
DNA is what composes the chromosomes which are seen here at the bottom centre and right.
**Lyr Lobo:** at some point, determine gender
**Stephen Xootfly:** chromosomes are the compacted form of the DNA double helix. Proteins called histones package them up.
**Nat Ure:** determine a set of characteristics made with protein
**Shailey Garfield:** Chromosomes are the basic building blocks of life
**Lyr Lobo** grins
**Lyr Lobo:** However, at the Pencil Factory, hehe I am, but the person behind me is the Penguin
**Stephen Xootfly:** McMillan is the penguin.
**Lyr Lobo:** the Pencil Factory has an exhibit by AngryBreath Shortbread that depicts your avatar's DNA strand
**Kip Roffo:** "McMillan is the penguin." -- How often does that get said at a lecture on chromosomes?



**Vic Michalak:** Here is where the coding for proteins comes into play... First we need to get to know the cell.
**Lyr Lobo** grins
**Lyr Lobo:** Love how visual this is...

**Vic Michalak:** In this slide you can see a cutaway cell with the nucleus where DNA is stored and other organelles in the cell.
**Lyr Lobo** nods and smiles
**Mr Geo Somerset:** mitochondria

**Vic Michalak:** For example, the blue mitochondria supply the cell with energy it needs to operate.

**Shailey Garfield:** Helix
**Stephen Xootfly:** 6 is smooth endoplasmic reticulum

**Vic Michalak:** The pink endoplasmic reticulum is like a transport system.
**Stephen Xootfly:** or perhaps Golgi.
**Chantal:** ツ

**Vic Michalak:** Each amino acid that makes up all proteins are coded by a sequence of three pairs of nucleic acids in DNA!
**CB Axel:** 4
**Mr Geo Somerset:** yes its codon 4

**Vic Michalak:** You can see how different combinations create different amino acids. ALSO there is a code for STOP and START!
A molecule called Transfer RNA comes along and makes kind of a copy of the DNA's instructions and takes this to the ribosome.
**ⓆⓊⒶⒺⓏⒶⓇ:** It gives instructions to the DNA
**Nat Ure:** just like a usb stick
**ⓆⓊⒶⒺⓏⒶⓇ:** ツ ok
**Stephen Xootfly:** mRNA is a copy of the DNA, but would be the directly used copy to encode the protein. Like the code sheet for a player piano.

**Vic Michalak:** Here you see what happens in the ribosome as the DNA instructions are read and amino acids are created and assembled into proteins!
**ⓆⓊⒶⒺⓏⒶⓇ:** So it is like a blueprint if I understand it right***?***
**Mr Geo Somerset:** there the engineers of cells
**ⓆⓊⒶⒺⓏⒶⓇ:** ok ツ

**Vic Michalak:** Proteins at first have a 1D shape (their amino acid sequence) but when they get some room they form beautiful 3D shapes like the insulin molecule at the bottom of the slide!
**Turnex Morellet**: protein folding?
**Vic Michalak:** Whew! Your whole cellular biology class in a matter of minutes! ツ
**Mr Geo Somerset:** DNA makes RNA make proteins
**ⓆⓊⒶⒺⓏⒶⓇ:** ツ That is always good .. Together we know MORE!
**ⓆⓊⒶⒺⓏⒶⓇ:** Indeed amazing..

**Vic Michalak:** So the bottom line is that only 4 symbols in DNA write ALL of the instructions for life.
**ⓆⓊⒶⒺⓏⒶⓇ:** 4 bases.. at the root of all live
CB Axel: That amazes me

**Vic Michalak:** You will see how computer communications is a very similar process...
**ⓆⓊⒶⒺⓏⒶⓇ:** Agreed
**Leo Mandelbrot:** so you can designate those 4 with only 2 bits

**Vic Michalak:** In a similar manner, computer storage devices contain a scaffolding made up of transistors or other simple repetitive structures.
**Leo Mandelbrot:** it's a switch
**Turnex Morellet:** amplification of signals?
**ⓆⓊⒶⒺⓏⒶⓇ:** ツ
**Mr Geo Somerset:** there doped and there p material and n material, base current
**Nat Ure:** FETs
**CB Axel:** Magic is how I explain all this stuff.
**Mr Geo Somerset:** yes it is Vic, gallium arsenide
**Turnex Morellet:** silicium?
**Mr Geo Somerset:** is used as the dope material
**Nat Ure:** germanium
**Mr Geo Somerset:** germanium is used in diodes
**Mr Geo Somerset:** that's a combination of two transistors that's called a jk flipflop
**Vic Michalak:** These hold simple codes of two units we call 1s and 0s which form the patterns that make up all of the text, numbers, sounds and pictures we send to each other.
**Turnex Morellet:** CDROM?
**Turnex Morellet:** WORM?
**Mr Geo Somerset:** it's an optical reader writer
**Mr Geo Somerset:** your voice is breaking up Vic

**Vic Michalak:** Here we see how there is also a mechanism to create the 1s and 0s (this is how a DVD is created).
You can also see that the size of DNA and the size of the 1s and 0s are not too dissimilar.
**ⓆⓊⒶⒺⓏⒶⓇ:** Welcome Moonsnail ツ
**CB Axel:** I hear you
**Paolo Rousselot:** loud & clear!
**Nat Ure:** I hear
**Mr Geo Somerset:** yes I can

**Leo Mandelbrot:** still OK audio
**Chantal:** yes ツ
**Turnex Morellet** hear you fine .. no break up
**Turnex Morellet** whispers: Unicode?
**ⓆⓊⒶⒺⓏⒶⓇ:** ツ
**Mr Geo Somerset:** 200
**Turnex Morellet:** too many :)
**Chantal:** :)))))
**ⓆⓊⒶⒺⓏⒶⓇ:** haha
**CB Axel:** Holy crap. No wonder I don't know Chinese.
**Leo Mandelbrot:** Hawaiian
**Turnex Morellet:** yep
**Moonsnail Mandelbrot:** Or....Greek!
**Turnex Morellet:** 2^16 (two bytes) weren't enough after all :)
**Leo Mandelbrot:** a 13 bit word should cover more than 6000 symbols

**Vic Michalak:** Here is an example of coding similar to the protein coding.
**Mr Geo Somerset:** transfer control protocol internet protocol
**Turnex Morellet:** MIME perhaps
**ⓆⓊⒶⒺⓏⒶⓇ:** or wireless
**Turnex Morellet:** going the other way in abstraction
**Chantal:** Welcome Android ツ

**Vic Michalak:** Here Chinese characters are coded by a sequence of 8-32 1s and 0s.
Now, if you look over to the right side (my left) you will see how a email or Web page is sent.
First the Application is just a string of 1s and 0s - this is broken up into blocks (like amino acids) that are easier to manage.
Then small headers of information are attached to the front as the packet is assembled (like the protein).
In telecommunications textbooks you can sometimes see an anthropomorphized character moving the packets along...
...much like Messenger RNA takes the code from DNA to the ribosome!
**ⓆⓊⒶⒺⓏⒶⓇ:** I wonder why they choose a 2 digits digital system instead of a 4 digit bin. System.. -0 +0 -1 +1 ...
**Android Neox:** You can try lots of things simultaneously
**Moonsnail Mandelbrot:** Hmm, wondering how this all addresses the issues around "junk" DNA - which apparently is NOT all junk?
**Leo Mandelbrot:** some demos on simple addition is all I've read
**Android Neox:** Good for things like traveling salesman problem
**ⓆⓊⒶⒺⓏⒶⓇ:** https://en.wikipedia.org/wiki/DNA_computing
**Leo Mandelbrot:** Android I think you are thinking of quantum computing
**Android Neox:** http://www.nature.com/news/2000/000113/full/news000113-10.html
**Nat Ure:** my computer has lots of junk
**ⓆⓊⒶⒺⓏⒶⓇ:** ;:)
**Turnex Morellet:** are there any QM effects in DNA and RNA?
**Lyr Lobo** waves her thanks and dashes to class
**Android Neox:** In quantum computing the q-bits contain multiple states. In DNA computing you can use astronomical numbers of DNA strands and then test them for which sequence solves the problem.

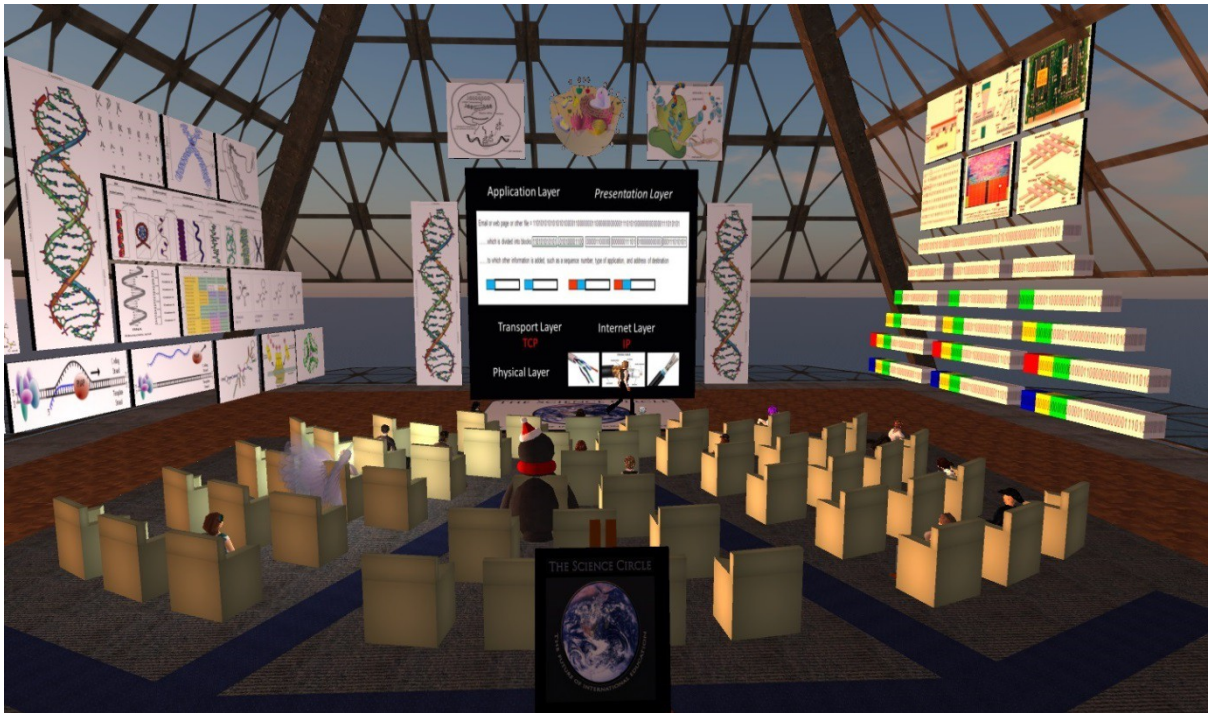
**Turnex Morellet:** I mean do DNA replications require QM effects=
**Lyr Lobo:** wonderful session *cheers*
**ⓆⓊⒶⒺⓏⒶⓇ:** ツ haha
**Paolo Rousselot:** wonderful!
**Shailey Garfield:** It was wonderful, Vic.


**Vic Michalak: Thank you for attending today!**
**StJohn Noyes:** Thank you, Vic
**Mr Geo Somerset:** they use binary because switches has two states either on or off the only exception to this is a tri state buffer which has a third floating state
**ⓆⓊⒶⒺⓏⒶⓇ:** Sure was great Vic.. Like always
**Nat Ure:** thank you Vic
**Leo Mandelbrot:** Very interesting. Thanks
**McMillan** throws pilchards on stage

**Chantal:** Thank you Vic, this was a wonderful start of the new season!
Again everyone:
This lecture will be recorded and placed on our website as PDF.
Photos taken here can show up on our
Website http://sciencecircle.org/
LinkedIn http://www.linkedin.com/company/science-circle
Or the Facebook page of SC https://www.facebook.com/groups/155012474522202/
Enjoy SL ツ

**Android Neox:** I'm sorry I missed it. RL was uncooperative.
**Turnex Morellet:** you still open for questions, Vic?
**Shailey Garfield:** very grateful that you delivered this talk, Vic.
**Android Neox:** Excellent... I'd love a copy.

**Mr Geo Somerset:** they use binary because switches has two states either on or off the only exception to this is a tri state buffer which has a third floating state
**Chantal:** Android I will hand you our agenda... I will make a PDF out of the lecture
**Turnex Morellet:** do you see any connection to the physical aspect of proteins compared to the "syntax" only structure of bits?
**Shailey Garfield:** Yes, it is after 8 pm here in the UK.
**Turnex Morellet:** bits only make sense in certain contexts? DNA makes sense in its own right?
**CB Axel:** mutation
**Mr Geo Somerset:** mutations
**ⓆⓊⒶⒺⓏⒶⓇ:** Chaos ツ
**Mr Geo Somerset:** cancers
**Turnex Morellet:** but with bits mutation means errors .. usually
**Nat Ure:** dna uses error correction?
**ⓆⓊⒶⒺⓏⒶⓇ:** yep
**CB Axel:** But DNA is influenced by epigenes, too. Right?
**ⓆⓊⒶⒺⓏⒶⓇ:** Just like the tcp/ip prot.
**ⓆⓊⒶⒺⓏⒶⓇ:** RNA
**Mr Geo Somerset:** a single cell has a set life span of copies
**ⓆⓊⒶⒺⓏⒶⓇ:** We can place it on the website Vic.
**ⓆⓊⒶⒺⓏⒶⓇ:** Thank you very much for your time!
**CB Axel:** Thank you, Vic. I love these talks.
**Shailey Garfield:** Thank you, Vic.
**Mr Geo Somerset:** thanks Vic great lecture
**Chantal:** Thank you Vic ツ
**ⓆⓊⒶⒺⓏⒶⓇ:** CB ツ
**Paolo Rousselot:** Thanks Vic - good to see you & everyone else again!
**Turnex Morellet:** good talk, Vic
**McMillan** throws some extra pilchards on the stage
**Chantal:** Agrees Paolo ツ
**ἀρετή:** Thanks, I sure feel rusty..
**Moonsnail Mandelbrot:** Thanks, well done
**ⓆⓊⒶⒺⓏⒶⓇ:** Hurry to your students ツ




**Nat Ure:** want to know what the Monty hall problem is
**Turnex Morellet:** Wikipedia?
**Turnex Morellet:** :)
**Chantal:** ah you do huh Nat ツ
**Nat Ure:** I'll wait until 1st October
**Chantal:** Surprise surprise ツ
**Android Neox:** The Monty Hall problem is a probability problem where you receive new information during the problem that changes what you should do.
**Chantal:** Deep always makes her lectures interactive ツ
**Turnex Morellet:** ah
**Android Neox:** http://en.wikipedia.org/wiki/Monty_Hall_problem
**Nat Ure:** sounds like war
**Turnex Morellet:** those are fun
**Chantal:** It will be a lot of fun ツ
**CB Axel:** I can't make any of the Saturday ones. They all fall on my weekends to work. :(
**Vic Michalak:** Gotta run... thanks! And have fun....
**Turnex Morellet:** anyone know how fast a human cell is to divide from start to finish?
**Vic Michalak:** CB... The presentations will be stored on the Science Circle website...
**Turnex Morellet:** they always show DNA replication as really fast
**CB Axel:** I'll have to look for them. I really learn a lot at these.
**Vic Michalak:** I do too!
**ἀρετή:** interesting..
http://news.nationalgeographic.com/news/2003/02/0224_030224_DNAcomputer.html
**Android Neox:** Do you know about moth or butterfly DNA?
**Vic Michalak:** Nope... would have to look that one up..
**Android Neox:** I'm curious whether the caterpillar DNA and adult DNA is separate or mixed. Like whether, when they're in their chrysalis, new chromosomes kick in.
**ⓆⓊⒶⒺⓏⒶⓇ:** cause/effect?!

**Turnex Morellet:** thank you for the talk .. will look forward to the next one too ::)
**Vic Michalak:** Thank you, Turnex!
**Turnex Morellet:** btw, you also interested in 3D printing, Vic?
**Vic Michalak:** Yes!! We bought a 3D printer this summer for my students...
**Turnex Morellet:** perhaps 3D printing could be closer to a "self-replication" unit in the future
**Nat Ure:** just need to 3D print a computer
**ἀρετή:** why would you want to print a computer?
**Nat Ure:** then we get reproduction
**Vic Michalak:** Well, now they are talking about just sending a 3D printer with astronauts to Mars so they can make their own stuff there (with CAD instructions)
**Turnex Morellet**: how about a small robot that can print a copy of itself?
**Turnex Morellet:** couple that with (simulated) evolution and progress could become very fast
**Vic Michalak:** Turnex, actually there is a proposal for a 3D printer on (what do you call the crowd-sourcing funding site - oh! Kickstarter) that has instructions for making itself (all plastic parts)!!
**Nat Ure:** but if the printer just copied then would be no change
**Nat Ure:** so we have to invent male printers and female printers
**Vic Michalak:** Nat Ure - true! No change is boring...
**Vic Michalak:** ...except for the fatal mutation part.
**ἀρετή:** you can't print ethics on that..
**Turnex Morellet:** indeed.. but if the robot had a purpose encoded somehow and that encoding could be modified then evolution could derive "better" robots
**Nat Ure:** the computers with blue screens would not reproduce
**ⓆⓊⒶⒺⓏⒶⓇ:** ツ
**Turnex Morellet:** hehe
**Vic Michalak:** It boggles the mind...
**Turnex Morellet:** aye, need something different to encode genome than just "all the bits" in its program
**Vic Michalak**: Okay, really DO have to go now... "Have fun and prosper!" | ||| (made that up)
**Turnex Morellet** waves
**Nat Ure:** some years ago everything was going to be expert systems
**Chantal:** Waves ツ
**Nat Ure:** but it never took off
**Turnex Morellet:** well, nature don't have expert system.. But it does have evolution :)
**Nat Ure:** bye Vic
**Mr Geo Somerset:** bye Vic
**ἀρετή:** bye Vic