Evolution

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Genes and proteins

- DNA and chromosomes (folded up DNA)
- genes and codons
  - 4 alphabets (ACTG)
  - language of 64 triplets - codons
  - 20 amino acids
  - Sequence of amino acids is coded in DNA $\longrightarrow$ proteins
- proteins carry out the functions of life
  - transportation, gateways (Sodium channels in cell membranes)
  - structures for mechanical activity in the cell (molecular motor in bacteria)
  - structural - silk, hair, nail etc.
  - stimuli - cell surface receptors (bacterial motion in direction of increaing concentration of glucose)
  - catalysis - enzymes

Genes, species and speciation

- All genes in a population (say grey squirrels in N America) are partners in the long run
- They all should be good at working together with other genes in the gene pool
- Genes of another species do not have to get on well with those of another population - they do not have to share the same bodies
- Origin of species - gene pool of a population divides into two
- Why? Geographical separation
- Gene pools slowly drifing apart (eg: Grey squirrels in N America and Europe; grey squirrels and red squirrels)
- The ”river of genes” forks in evolutionary time never to meet again

Replicators

- An entity which can produce another entity just like itself
- The object is able to use the surrounding materials to make exact copies of itself, including replicas of such minor flaws in copying as may occasionaly arise
- exponential growth → competition for resources
- variants of the replicator may arise that happen to be more efficient at getting themselves duplicated
- The thresholds in evolution
  - Replicator threshold
  - Phenotype threshold
  - Replicator team threshold (bacteria)
  - Many-Cells threshold
  - High Speed Information Processing threshold (Nervous system)
  - Language threshold (humans)

From ”The Selfish Gene” by Richard Dawkins

What weird engines of self-preservation would the millennia bring forth? Four thousand million years on, what was to be the fate of the ancient replicators? They did not die out, for they are the past masters of the survival arts. But do not look for them floating loose in the sea; they gave up that cavalier freedom long ago. Now they swarm in huge colonies, safe inside gigantic lumbering robots, sealed off from the outside world, communicating with it by tortuous indirect routes, manipulating it by remote control. They are in you and me; they created us, body and mind;and their preservation is the ultimate rational for our existence. They have come a long way, those replicators. Now they go by the name of genes,and we are their survival machines.

Death

- Why do animals die?
- To “free” up resources?
- This needs invocation of competition between populations.
- My explanation: Mutations which reduce chances of survival before reproduction just do not get passed on. But mutations which do tha same after reproductive age do get passed on.