Week 14

The Universal Codes of Life: DNA, Genomics, Stem Cells

1. Intro
    a. So far the class:
        i. Focused on Hardware technology: Computers, etc.
        ii. Now, Can the idea be applied to biology?
    b. Panacea, to cure everything
        i. Greek goddess as a symbol
        ii. Postmodern technology? flexible, reconfigurable cureall
    c. Sources:
        i. The secret of Life, Discovery
2. DNA, Deoxyribonucleic acid
    a. Series of nucleotide units
        i. Each has one of four bases, AGCT as basic vocab of DNA (binary numbers)
        ii. G pairs with C, C with G
    b. Redundant and resilient structure.
    c. DNA replication: conservative, dispersive, or semi-conservative
        i. With 2 DNA strands, how similar are they?
        ii. Within a body, DNA should be consistent
    d. Genetic and physical maps
        i. Physical distance: number of base pairs
        ii. Genetic distance: expected
        iii. Subtle differences in base pairs, accounts for vast differences
            1. How your body is configured; nature
        iv. How to lead sequences
    e. Human genome in numbers
        i. 23 pairs of chromosomes
        ii. Males have 27M, women 44M
        iii. Proteins
            1. Large molecules composed of one or more chains of amino acids that perform specific tasks
                a. Fold, Self attract to form 3 D protein structures
3. Treating biology as an information science: bioinformatics, genomics, proteomics
    a. Biology not just as observational but now as informational
        i. How to model and analyze them in this sense
    b. The Genome: sum total of all an individual's genes
    c. Genomics, study of genome sequences in a cell/tissue
    d. Bioinformatics,
        i. Applying informatics technique from math, computer science and stats to understand and organize the information of molecules, biological data

            a. Basically, design molecules
        ii. How to use?
            1. Store/retrieve biological info
            2. Predict function of unknown genes/proteins
            3. Ie. DNA amplification
                a. PCM
    e. Proteomics
        i. Study of proteins,
        ii. Visualization of protein structures
        iii. Make protein-protein comparisons
        iv. Ie. Forensics, matching DNA
    f. Implication for biomedicine
        i. Virtually all medical conditions have a genetic component
            1. Creating these drugs, will be able to solve more.
            2. All biologists and doctors will use gene sequences information in their daily work
        ii. All about the incredible range of problems, not just one.
4. Video Clip: the Secret of Life
    a. Discovery of DNA as heredity, not proteins
    b. First structure of helix built,
        i. Roselyn Franklin x-ray features of DNA
    c. To have knowledge on science then being able to change it
5. The Human Genome Project
    a. Sequencing the human genome project and apply it
    b. Video Clip, Presentation by Craig Venter
        i. What is life, digitizing, analog world of biology into digital world of computer
        ii. Can you create new life out of this?
        iii. Can chemistry make large molecules and make chromosomes?
    c. We need solutions now for the future, but we want to limit gap between present and future
        i. What is the rush? Such a complicated things, so many variable
        ii. Epistemological discovery?
            1. With DNA you can get it wrong or right, but with the genome it is not as clear?
                a. When there was 97% of it done, they called it finished
                b. Wasn't a brilliant insight, illusion..
            2. Potential, mapping the human genome, while it in itself is not an end, it will be crucial for an enormous amount of things
                a. "Paving the road" / genome as infrastructure
                b. all the investments that went into the race has generated many new technologies
                c. Craig, self-reverential

d. Joke: soon there will be a iPhone app?!

d. The NYT Reading on Venter
    i. What is being discovered with the genome project?
        1. "The flood gates will open" rhetoric
        2. Building the highway system, infrastructure

6. Universal Cells: Stem Cells
    a. Cells that exhibit plasticity, transformability
        i. Cells that can become almost any cell-multipotent
    b. Where do they come from?
        i. Adult
            1. Multipotent, difficult to isolate
            2. Cord cells, placenta, children, adults
            3. USED for leukemia
        ii. Embryonic (controversial, when does life start?)
            1. Totipotent, easy to isolate
            2. Blastocyst
            3. USED: can do anything
    c. How do they form?
        i. Embryonic stem cells,
            1. How do they fuse with other cells?
        ii. Vatican approved adult stem cells
        iii. No FDA approval for the use
    d. Creating embryos in clinics for purpose of collecting stem cells:
        i. Epitome of using human's as standing resources
        ii. Incubators full of
        iii. Embryos grown specifically to "be harvested"
    e. When does life begin or how to utilize human life?
        i. Valuing of "personhood"
        ii. Now able to create life, but not yet personhood
        iii. Embryonic stem cells differentiate in lab settings?
    f. Heidegger/Stem Cells
        i. Stand reserve or resource, as a bad thing
        ii. In what sense, takes away our sense/ability of being of world revealers?
        iii. Matters of degree, enframing is more operable, it is extending itself onto other things
            1. Very puzzling, doesn't seem that there is any
        iv. Dreyfus: stems cells are plastic, can be anything
            1. Losing their essence
            2. How we understand our being
                a. if we understand ourselves as transformable,
                b. Committing self to things, given a definition and a calling, that is what we would lose.

3. Can we have lots of transformable tech and not be transformable? Can we keep our uniqueness?

v. Ontic way of thinking about it, ethos

g. In pre-modern sense: If we are born with deformities, we take them for granted

h. In modern sense: We exert control over our bodies. We lose our sense of wonder.

i. Control over our body as we begin to produce them,

ii. Improve our bodies.

i. Threatening to sweep men away, there is one revealing

i. Ontological danger

1. In postmodern sense, everything loses essence

2. The Real Danger: will be lose our essence.

ii. The Rhine River: fishing, boating, swimming, subject and object, creation of god. We are losing these modes of revealing the river.

iii. The analogy doesn't hold up with stem cells: we have never had relationship with stem cells, so there is nothing to be lost?

iv. For stem cells, medicine in the past, plants just worked

j. Readings

i. Idea of resistance

1. Synthetic biology

k. Synthetic biology

i. Spider example: changing type of web fiber and the way they spin webs

l. Resist it and see how different we are.

i. We can create anything from generic cells