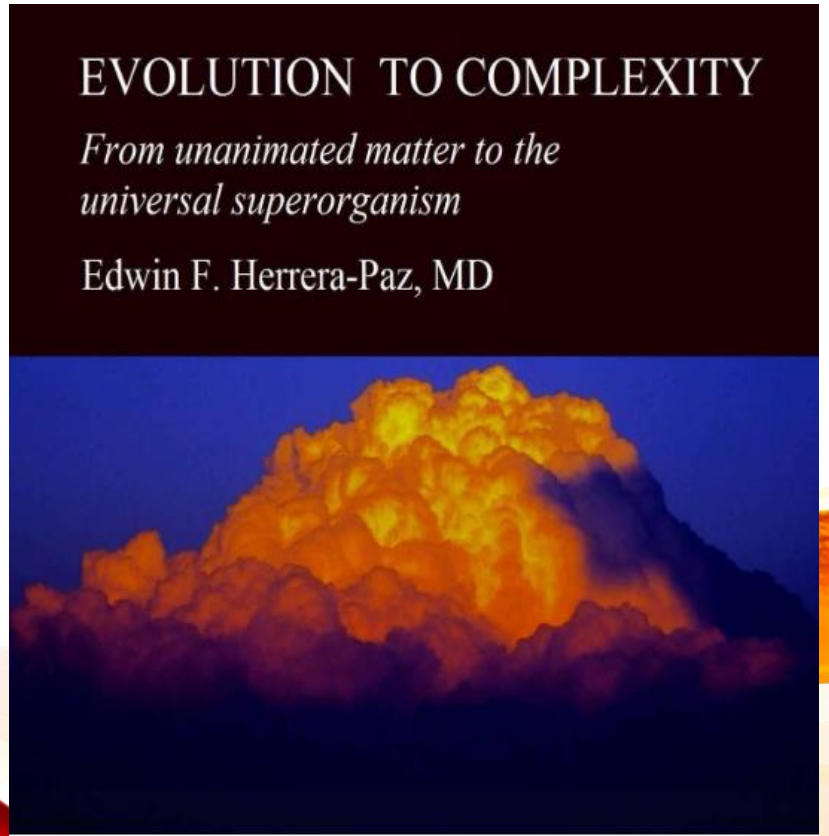
TRANSITION OF HUMANITY TOWARDS A SUPERORGANISM IN THE CONTEXT OF EVOLUTION TO COMPLEXITY

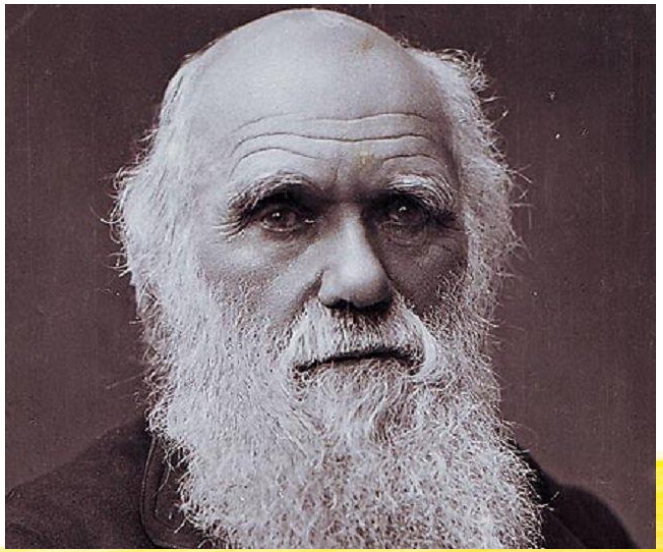


DARWINIAN EVOLUTION

Contributions to evolution to complexity

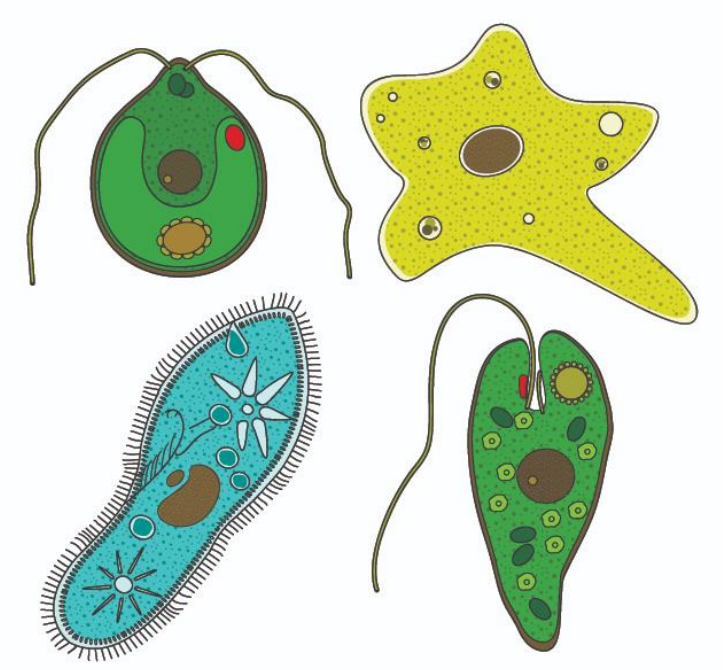
1) Common descent: Radiation, though, diversity

2) Natural selection

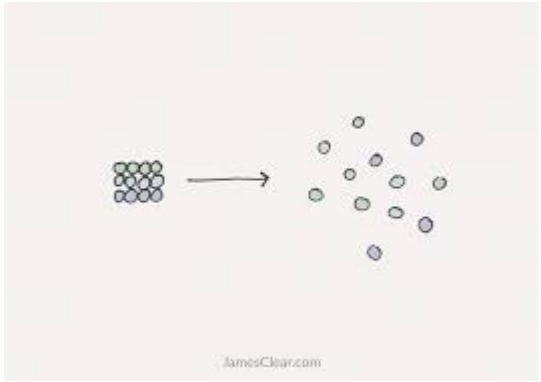


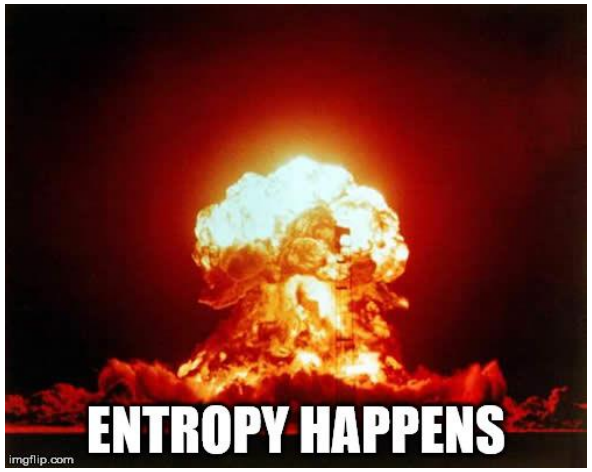
- Divergence: diversity *per se* do not explain complexity

- Natural selection: more complex is not equal to more adapted



- Entropy is the arrow of time: irreversible phenomena
- Entropy destroys complexity





HOW DOES LIFE EVOLVES TO MORE COMPLEX FORMS DESPITE ENTROPY?

Erwin Schrödinger: Living systems (far from thermodynamic equilibrium) can lower entropy with the condition that total entropy raises

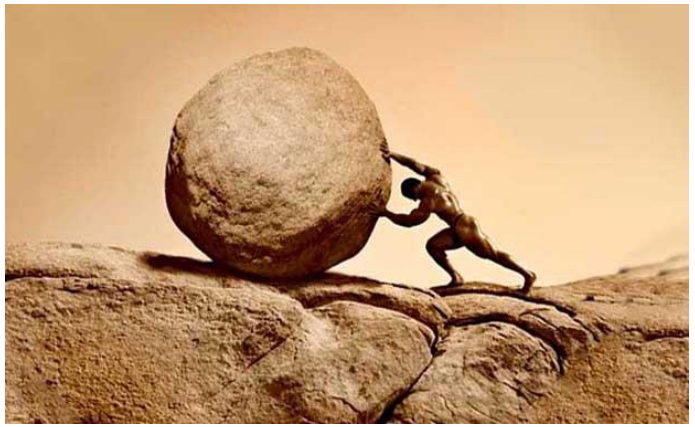
Illya Prigogine: Complex forms emerge far from thermodinamical equilibrium (auto-organization)

1) The universe, not just life, is evolving toward more complex forms via the four forces

Fast and Explosive

Vs.

Persistence



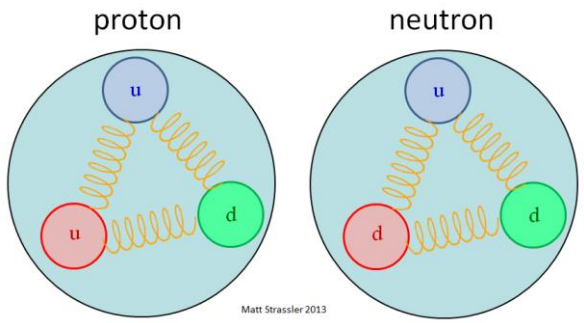
2) Entropy does not oppose evolution to complexity. It is one of its key elements

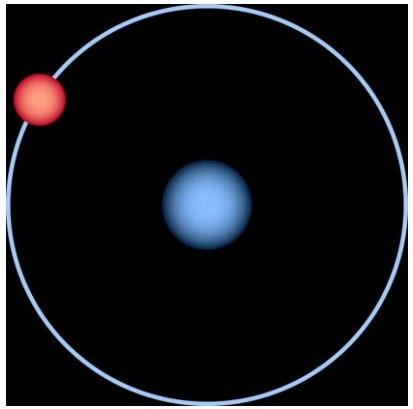
THE UNIVERSE IS CONSTRUCTED TO EVOLVE TOWARDS INCREASING COMPLEXITY

Before the first second after Big Bang (BB): superforce. Soup of protons, neutrons and electrons

377,000 years after the BB: Electromagnetic force. Protons traped electrons. First hydrogen atoms. Light appeared

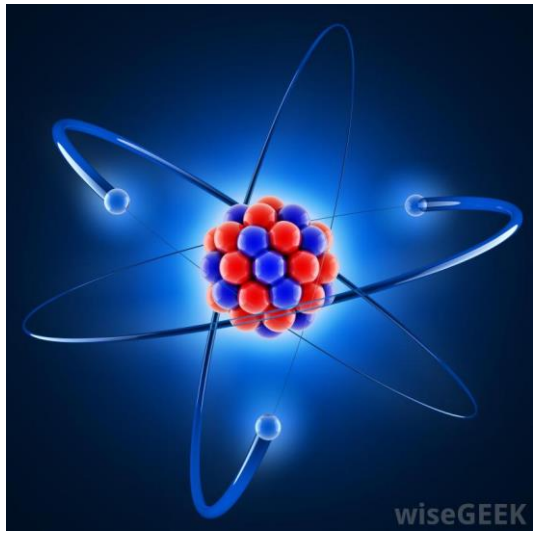
200,000,000 years after BB: Gravitational force: The first generation of stars appeared. Afterwards, complex galaxies



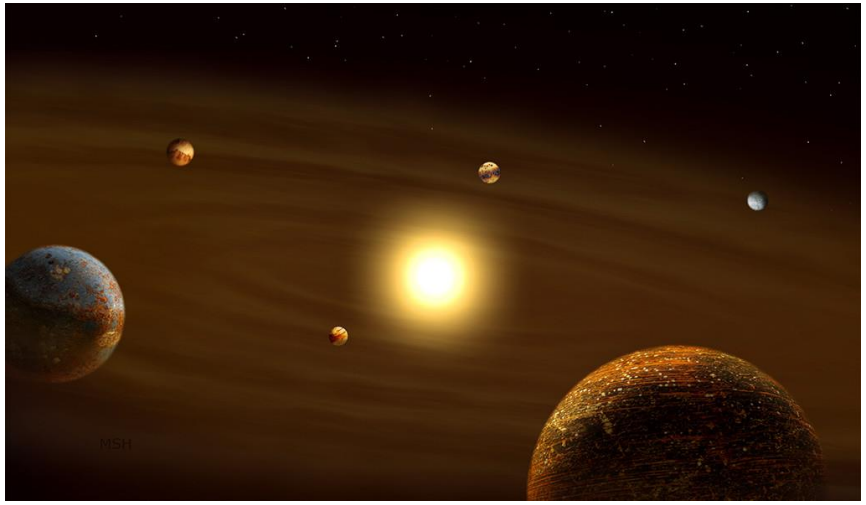


THE UNIVERSE IS CONSTRUCTED TO EVOLVE TOWARDS INCREASING COMPLEXITY

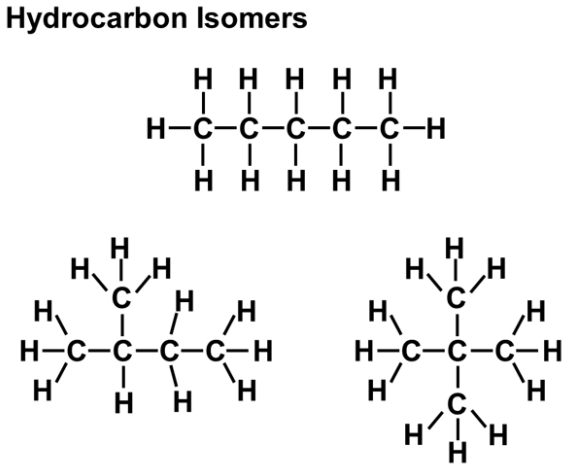
Within stars: Strong force. Stelar nucleosynthesis



Dying stars: Supernovas, second generation of stars with planetary systems.



Within planets: Electromagnetic force: Complex molecules. Life is possible



PHASES OF THE UNIVERSE

- Each phase allows a new form of complexity, fundamental for the next phase

- A change in state → universal phase transitions

KEY ELEMENTS IN EVOLUTION TO COMPLEXITY IN LIFE

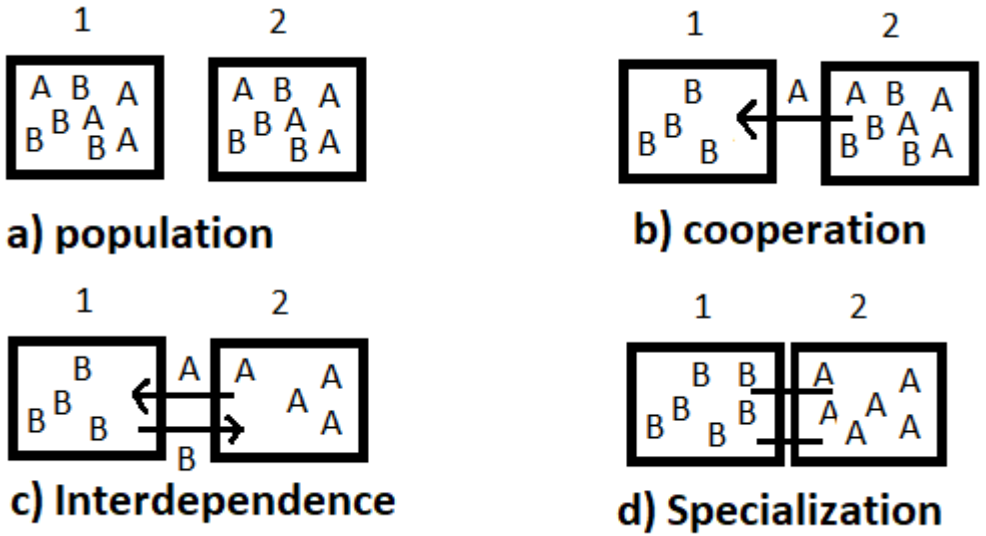
1) Entropy

2) Inventions

1) ENTROPIC SIMPLIFICATION

A MODEL OF EVOLUTION TO COMPLEXITY BASED IN ENTROPY

In d), the group has become an organism of a higher level. It could have an advantage over a) due to economy of scales



ENTROPIC SIMPLIFICATION

LOSE OF COMPETENCE BETWEEN THE ELEMENTS, THOUGH, LOSE OF NATURAL SELECTION, ALL DUE TO A BENEVOLENT MILIEU OF COOPERATION

GENE SILENCING.

1) ACCUMULATING MUTATIONS

2) EPIGENETIC SILENCING

TWO TYPES OF NATURAL SELECTION

Purifyng selection: phylogenetic conservation. If environmental preassure dissapears → gene silencing, or entropic simplification

Directional selection: inventions

EXAMPLES OF ENTROPIC SIMPLIFICATION

1. At the subcelular level (organelles): Bacteria uses almost all their genes in order to survive. Mitochondria in human eucariotic cells, which are derived from bacteria, uses only 13 genes

2. At the celular level: A protozoarian uses almost all its genes in order to survive, while a cell in a complex metazoarian has most of its genes silenced

3. Cancer cells are stronger than normal cells. Cancer cells return to a primitive, undifferentiated state.

EXAMPLES OF ENTROPIC SIMPLIFICATION

4. At the molecular level: Vma proteins in fungi evolved from a single, versatile protein.

EXAMPLES OF ENTROPIC SIMPLIFICATION: LEVEL OF HUMAN ORGANISM

- A primitive person performed more tasks than a modern one
- Primitive persons had better vision than a modern one
- Human digestive system is simpler compared to other hominids
- Human birth process has to be assisted

CONSORTIUM ON ASTHMA IN POPULATIONS OF AFRICAN-ANCESTRY OF THE AMERICAS

- Deep sequencing of 2005 genomes from 17 sites in North, South, and Central America

nature COMMUNICATIONS

ARTICLE

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A continuum of admixture in the Western Hemisphere revealed by the African Diaspora genome

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The African Diaspora in the Western Hemisphere represents one of the largest forced migrations in history and had a profound impact on genetic diversity in modern populations. To date, the fine-scale population structure of descendants of the African Diaspora remains largely uncharacterized. Here we

- Possitive correlation of the proportion of deleterious alleles in coding sites, with African Ancestry ($r = -0.23$)

- Among coding sites of the genome, we saw proportionally fewer deleterious alleles in regions of African ancestry compared with European ancestry (that is, 1.33% and 1.41%, respectively)

EXAMPLES OF ENTROPIC SIMPLIFICATION: TRAITS THAT ARE PROBABLY BEING RELEASED FROM SELECTIVE PRESSURE

- Immune systems
- Head size
- Memory
- Sexual dimorfism

2) INVENTIONS

INVENTIONS: GENETIC VARIANTS THAT PROVIDE A SELECTIVE ADVANTAGE

- Also a product of entropy
- Based on shuffling of prior configurations
- Follow a Pareto distribution
- Contributes to benevolent milieu that drives to further simplification and interdependance of the elements

INVENTIONS

Communications:

- Organisms → Signaling molecules, nervous systems
- Human communities → Spoken and writen language (most important) horse emisaries, mails, telegraph, phones, internet

Transport systems:

- Cells → Microtubules and kinecines
- Organisms → Cardiovascular systems
- Human communities → Roads, streets, every sort of vehicles

Adherence to the community:

- Multicelular organisms → Adherence molecules (collagen, selectines, integrines)
- Human societies → Transition from hunter gatherers to agriculturalist (sedentarism), work at home

DR. CARMEL´S FOUR INDICATORS OF EVOLUTION TO COMPLEXITY

- System size
- Inseparability
- Reproductive specialization
- Labor specialization

1. SYSTEM SIZE

- Interlevel growth

  Limitations or scale constraints

  1) Cells: Interchange of food and waste (square-cube law), transport of substances between the nucleus and the membrane
  2) Multicelular organisms: Gravity, heat dispersión, transport of substances (Cardiovascular sistems), communication (nervous systems)
  3) Cities: Availability of land, water, garbage disposal, transport

- New level of complexity → Transition
- Fractality: Evolution in each level resembles prior levels

FRACTALITY (EXAMPLES)

- Immune systems in bacteria and in multicelular organisms, and armies
- Sex (genetic shuffling at 3 levels of complexity)
- Electromagnetic communication systems
- Protecting barriers: cell membrane, skin, borders

Overlooking evolution of a feature in one level, can allow us to make some predictions in higher levels

Example: Nervous systems and electro,agnetic communication systems

- Sponges: no nervous systems
- Jellyfishes: Difuse and homogeneous neural network
- Bilaterians: Central nervous system (CNS) and nerves. CNSs include a cord and segmental ganglions
- Rostral ganglion: brain

2. INSEPARABILITY
KEY CRITERION: CAN AN ELEMENT SURVIVE OR REPRODUCE OUTSIDE THE COMMUNITY?

1) Interdependence ← Simplification, specialization

    1) Mitochondria can't live outside the cell compared to their ancestors

    2) Cells in the multicellular organism

    3) Modern humans compared to primitive humans

2) Adequate transport and communication systems, and community adherence

3. SEXUAL SPECIALIZATION

- We see sexual specialization in organisms and superorganisms

- Are humans experiencing sexual specialization?

3. SEXUAL SPECIALIZATION

Sexual dimorphism expreses at various levels

1) Chromosome
2) Gonadal level
3) Genitalia
4) Secondary sexual characteristics
5) Psicological
6) Sexual orientation

3. SEXUAL SPECIALIZATION: PRESENT EVIDENCE

1) Drop in fertility rates (cause and effect, possitive feedback loop)

2) Drop in testosterone levels

3) Drop in sperm counts

4) Raise in the number of consultations for infertility

5) Raise in the number of adoptions

6) Drop in the number of people uninterested in sexual intercourse

7) Gender ideology

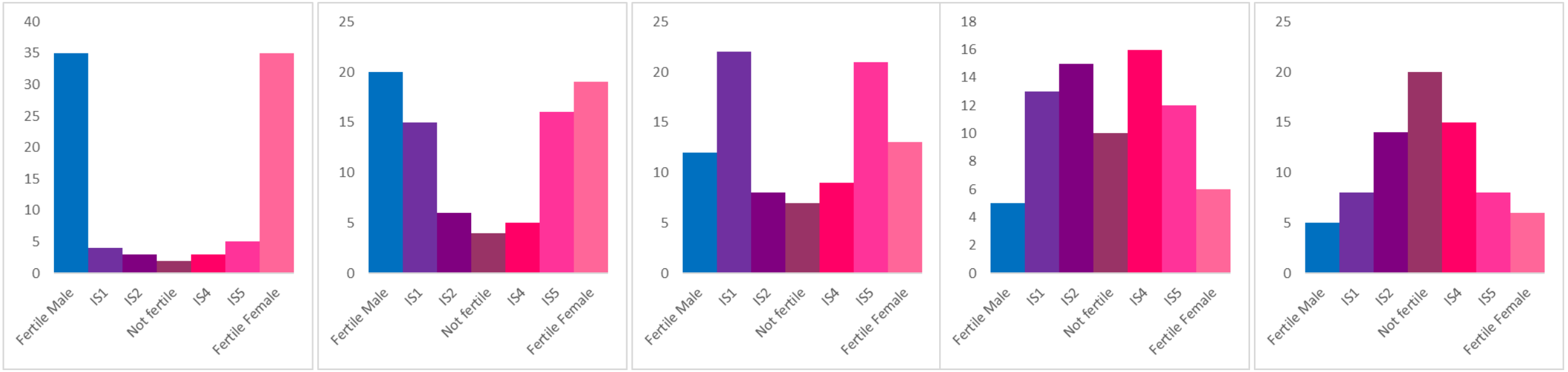
3. SEXUAL SPECIALIZATION: CAUSES

Lose of reproductive competense

1) Drop in fertility rates in indrustrialized countries
   A) Demographic transition
      Production is more relevant than reproduction
      High coasts of raising a child
   B) Enhancement in contraceptive methods

2) Medical aids for infertility: assited reproduction

3. SEXUAL SPECIALIZATION



Possitive feedback loop: phase transition

3. SEXUAL SPECIALIZATION

- Detrimental mutations → Allele frequencies maintained by selection at the population level
- Epigenetic gene silencing: methylation
- Both

4. LABOR SPECIALIZATION: SILENCING ALL POTENCIALITIES EXCEPT ONE

Presently:

1) Is there a genetic component in laboral aptitudes?

2) Developmental plasticity
   a) Epigenetic
   b) Neuronal conexions → Neural plasticity

3) Both

4. LABOR SPECIALIZATION

Future (speculative)

1) Urban problem: traffic jams, drop in labor time, and high costs of transportation due to distance between homes and workplaces

2) Urban planning: homes near working places

3) Geographic stratification, selection, and fast divergence between groups → Genetic stratification.

4) Positive feedback loop → phase transition

OTHER IMPLICATIONS

- Political systems: socialism vs. Capitalism

Most probable → Evolution to utopic comunism with elements of free market

- Longevity

- Genetic enhancement: Mendelian diseases, intelligence, beauty, sports performance, special skills. Simplification: many thousands of traits

CHANGE IN PARADIGM

Eugenics paradigm: In order to enhance human societies, the human being has to be genetically enhanced through positive and negative eugenics. Human beings have to express the best possible genes in every genomic site

Evolution to complexity paradigm: In order to enhance human societies, the human being has to be simplified in his laboral skills (and other traits), and guided toward specialization, so he or she can master his or her areas and provide society with his or her best posible product

A direct consequence of the entropic simplification theory in evolution to complexity is: It can be inferred that a complex molecular world existed prior to cellular life. All three molecules of life, DNA, RNA, and proteins, are capable of containing sequence information, as well as functions that depend on tridimentional form. These molecules aquired further simplification, specialization and interdependance during the increasing complexity of the cell.

THANK YOU