

# Aspects of Cosmic Evolution Relevant to Biology

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The Whitehead Metaphysical Society in Poland



**JOHN TEMPLETON FOUNDATION**  
SUPPORTING SCIENCE - INVESTING IN THE BIG QUESTIONS



**COPERNICUS CENTER FOR INTERDISCIPLINARY STUDIES**

## Outline:

1. Background: quantifying cosmic evolution
2. Observation 1: punctuated evolution
3. Observation 2: micro-macro connection
4. Observation 3: global nature of change
5. Perspectives

# 1. Background: QUANTIFYING COSMIC EVOLUTION

dugongs 599.55  
dugouts 629.521  
  fortifications 623.24  
dukes 929.732  
Dukes County (Massachusetts)  
  1e(734.417.1)  
Dukhan 1e(536.44)  
dulcimers 780.616.41  
dull colours 159.937.511.5  
dull-wittedness 616.899.2  
dullness (psychic) 616.89-008.453  
Dulong and Petit's law 544.333  
Dulong experiment 533.23  
Duluth (Minnesota) 1e(737.669.4)  
dum-dum bullets 623.455.12  
Dumaran Island 1e(599.18)  
dumb blondes 791-561  
dumb persons 1k-056.263  
dumbbells 685.641  
dumbness 159.946.3  
Dumfries and Galloway 1e(410.526)  
Dumfriesshire 1e(414.8)  
dummies (teats) 615.477.84  
dummy (sporting tactic) 796.054.22  
dummy barrels 623.427  
dummy joints 624.078.37  
dummy medication 615.039  
dummy rounds 623.456  
dummy structures 623.777  
dump cars 621.86.068  
dump ploughs 622.271.4

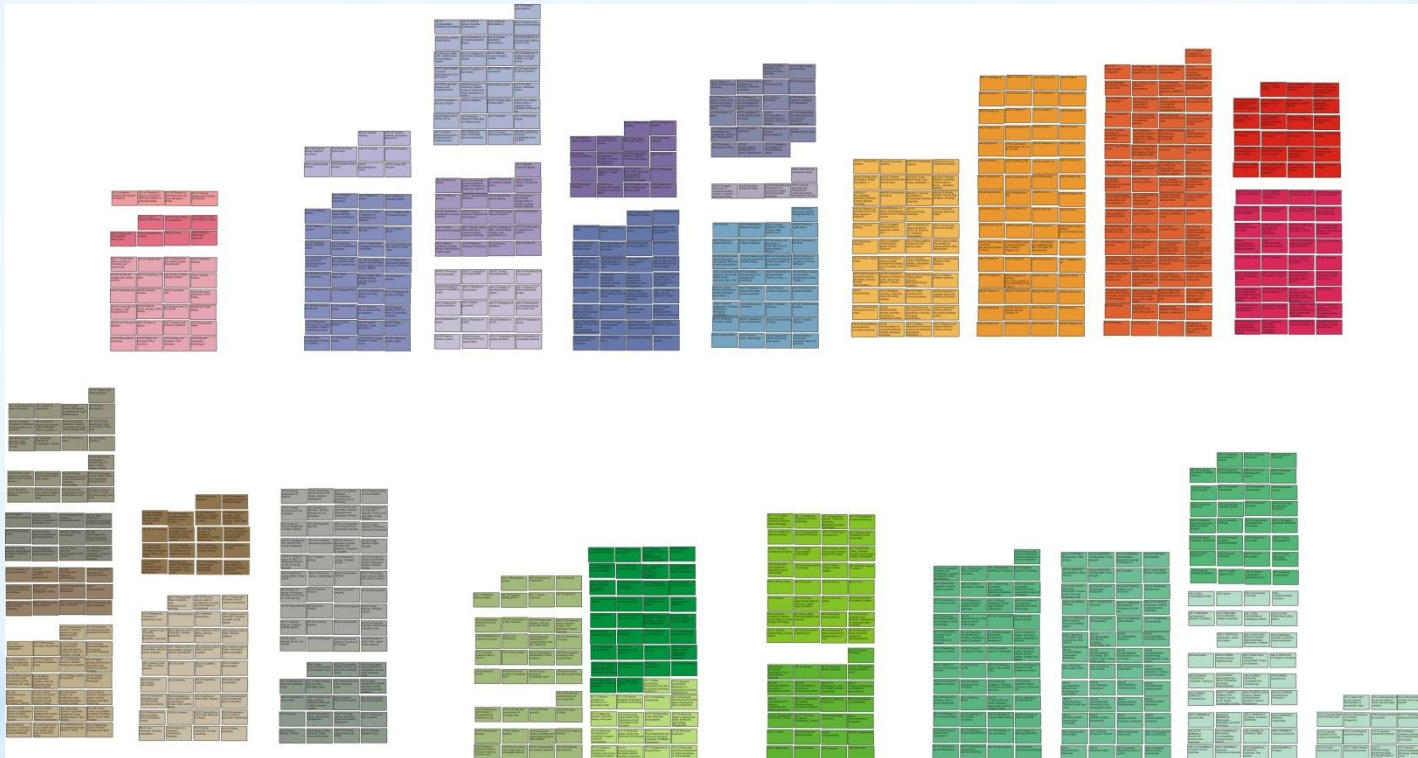
Dunmore Town 1e(729.011.19)  
Dunn County  
  North Dakota 1e(738.461.4)  
  Wisconsin 1e(737.538.3)  
dunnage 629.4.045  
dunnock 598.288.4  
duodenal orifice (pathology) 616.334  
duodenal papilla 616.367  
duodenum  
  anatomy 611.34  
  disorders (remedies) 615.243  
  pathology 616.342  
duos (chamber music) 785.72  
duplex printing 655.3.024.2lex processes  
  669.183.5  
duplex pumps 621.656  
duplex radio transmission 621.396.41  
duplex sheet (form of materials) 62-419.4  
duplex telegraphy 621.394.43  
duplex telephony 621.395.42  
duplicate and exchange departments  
  025.26  
duplicate bookkeeping 657.126  
duplicated documents 1d(0.035)  
duplicating apparatus (photography)  
  771.318  
duplicating inks 667.53  
duplicating machines 681.621  
duplicating mechanisms  
  (typewriters/composers) 681.61.067.6  
duplication

Durres 1e(496.536)  
Duru language group  
dusk 1g"345.2"  
dusk light 551.593.55  
dusky salamanders 5  
Düsseldorf (Regierung)  
  1e(430.119.1)  
dust 628.511.1  
  analytical chemistry  
  in the lungs 616.24-  
  measures against 6  
  occupational health  
  prevention of forma  
  roadworks-caused f  
  sources 622.411.5  
dust-bearing winds 55  
dust-borne diseases 6  
dust collectors 621.92  
dust columns 623.454  
dust container wagon  
dust contamination 62  
dust detectors 520.68  
dust devils 551.515.3  
dust eaters 591.531.4  
dust excluders 646.67  
dust extractors 62-76:  
  621.928.9  
dust filters  
  air conditioning 697  
  beer brewing 663.4  
dust inhibitors 66.022  
dust jackets 686.122.1

# 1. Background: QUANTIFYING COSMIC EVOLUTION

530. Theoretical foundations of physics	544 Physical chemistry	550.34-6, 551.11 Geotectonics. Earthquakes. Thermodynamics	593 Protozoa, 578 Viruses, 579 Bacteria
531. General mechanics. Mech. of solid and rigid bodies	546 Inorganic chemistry	550.37-8 Earth's electric and magnetic fields	573 General and theoretical biology, 574 Ecology
532. Fluid mechanics	547 Organic chemistry	550.4 Geochemistry, 550.7 Geobiology	577 Biochemistry, Biophysics, Molecular biology
533. Mechanics of gases. Plasma physics	548 Crystallography	(551.) General geology. Geomorphology	581 General botany
534. Vibrations. Waves. Acoustics	549 Mineralogy	(551.) Marine geology. Meteorology. Climatology.	582 Systematic botany (incl. Fungi)
535. Optics		552 Petrology	591 General zoology
536. Thermodynamics. Statistical physics	521 Theoretical astronomy. Celestial mechanics	553 Economic geology. Mineral deposits	593, 594, 595.1 Invertebrates (excl. Arthropoda)
537 Electricity. Magnetism. Electromagnetism	523 The Solar System	556 Hydrosphere. Water in general. Hydrology	595.3-595.7 Arthropoda
538.9 Physics of condensed matter	524 Stars. Stellar systems. The Universe		596-599 Chordata
539 Physical nature of matter			572 Anthropology

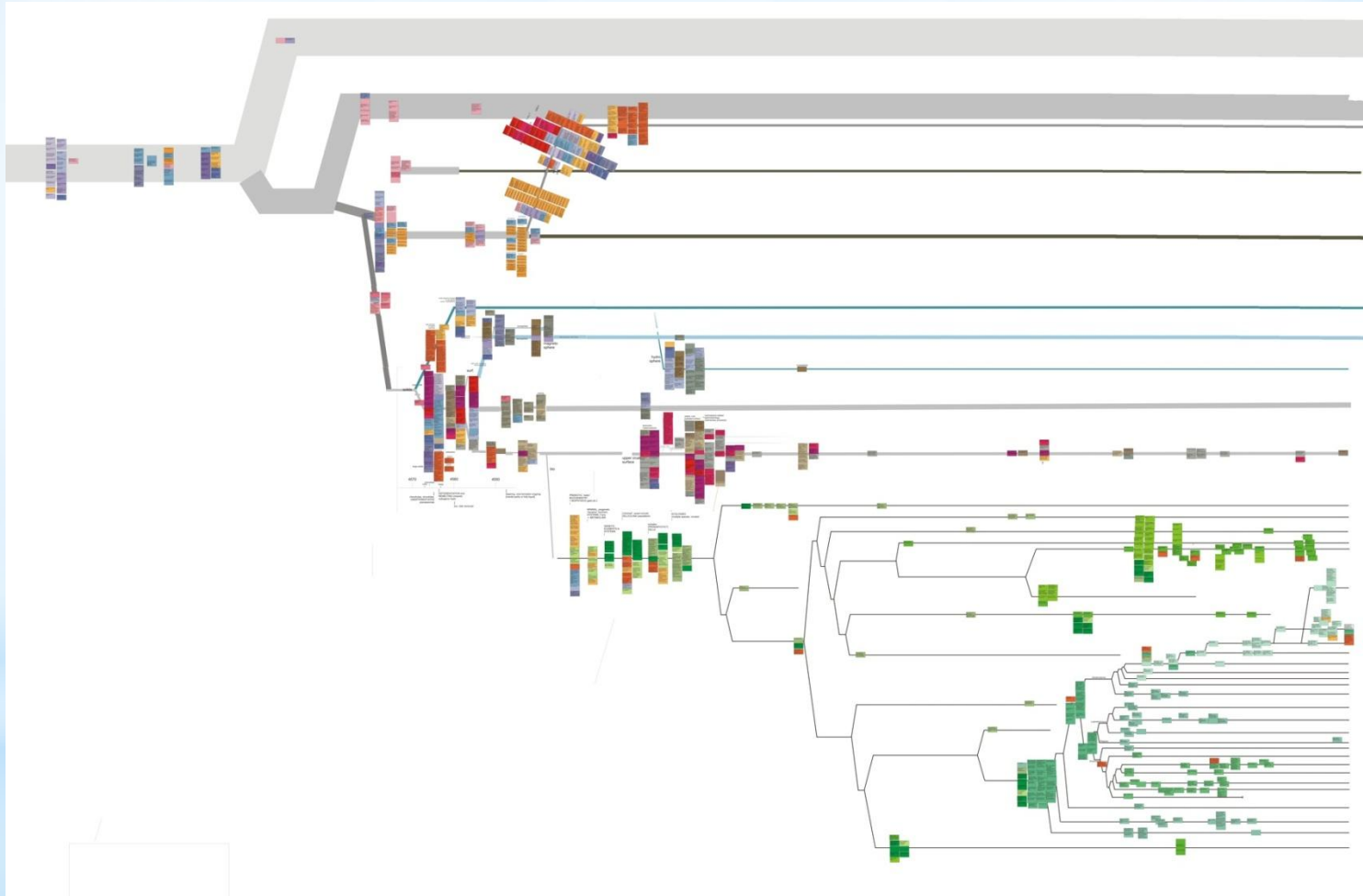
# 1. Background: QUANTIFYING COSMIC EVOLUTION



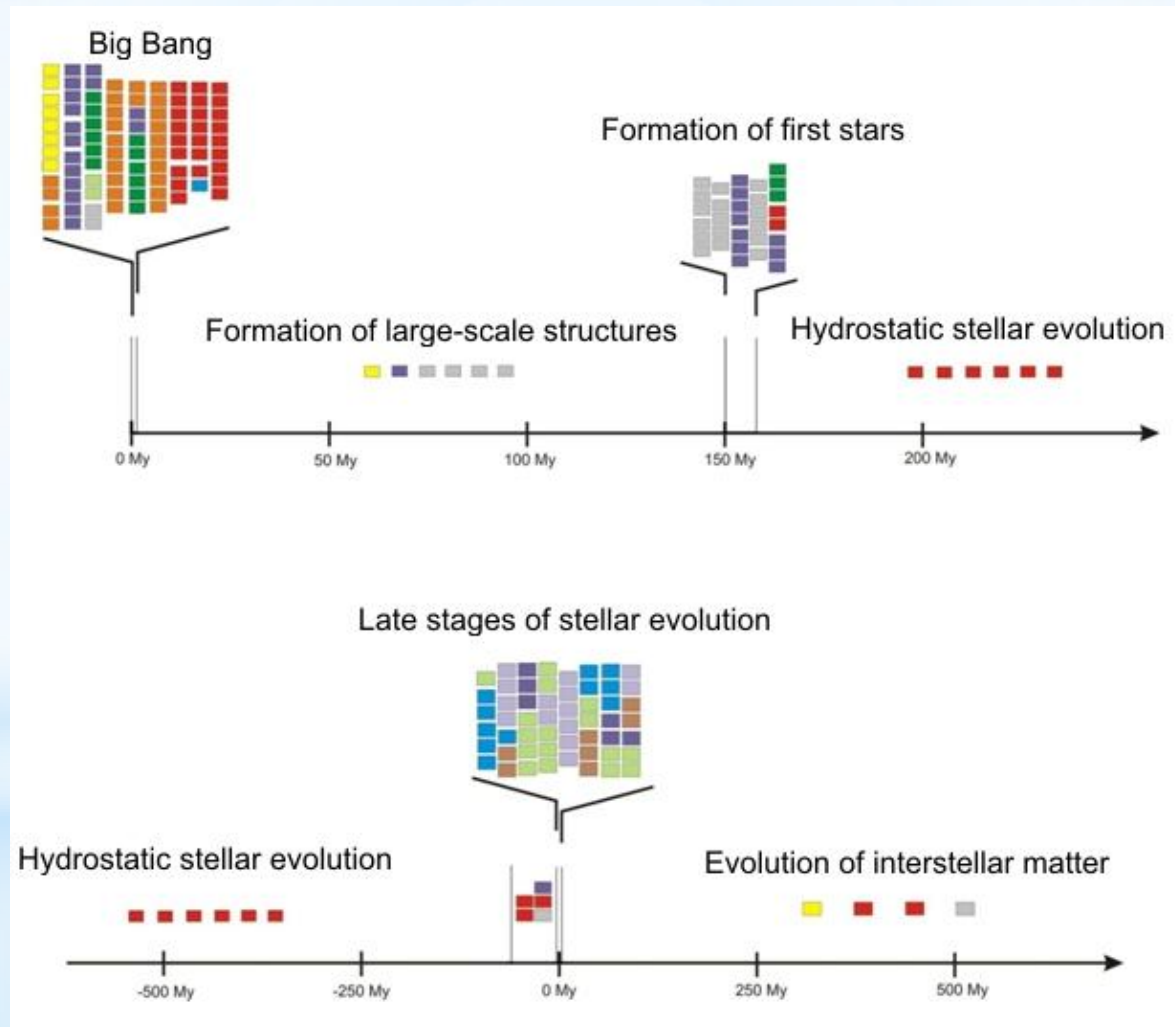
873 classes, e.g. „Interstellar dust”, „Friction”, „Surface tension” „Plastic deformation”, „Liquid crystals”, „Rare earths”, „Phenols”, „Basic silicates”, „Volcanism”, „Erosion and weathering”, „Radiolaria”, „Cell division”, „Blood”...



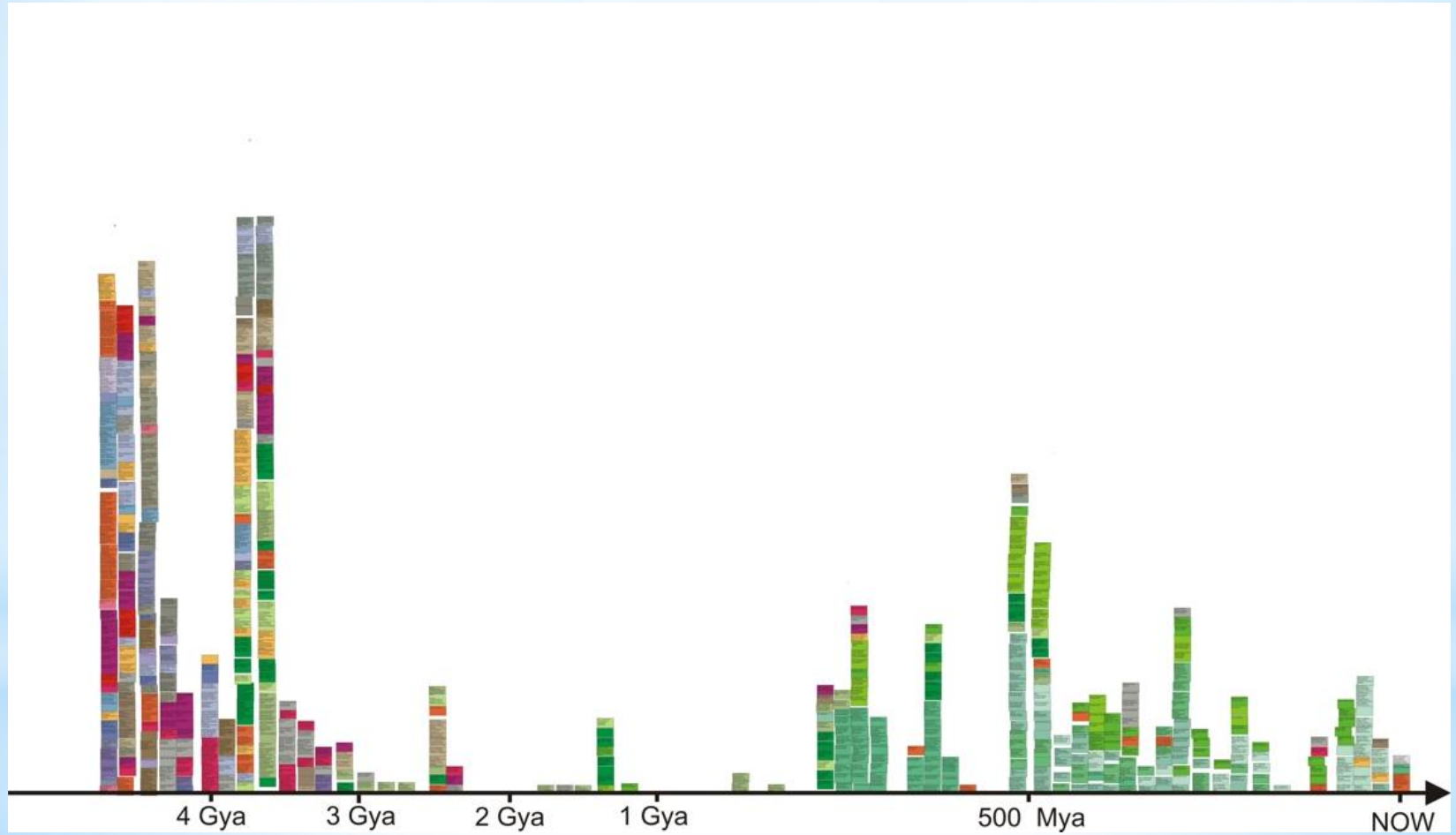
# 1. Background: QUANTIFYING COSMIC EVOLUTION



## 2. Punctuated evolution

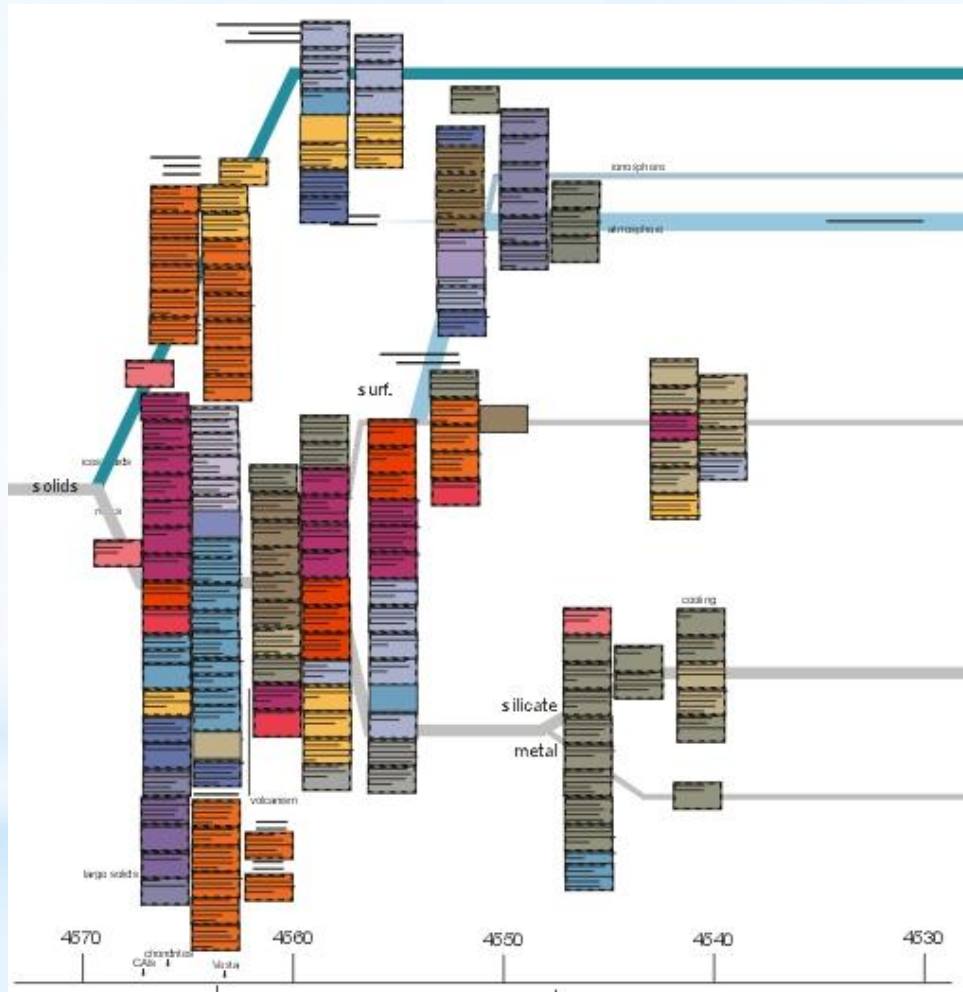


## 2. Punctuated evolution



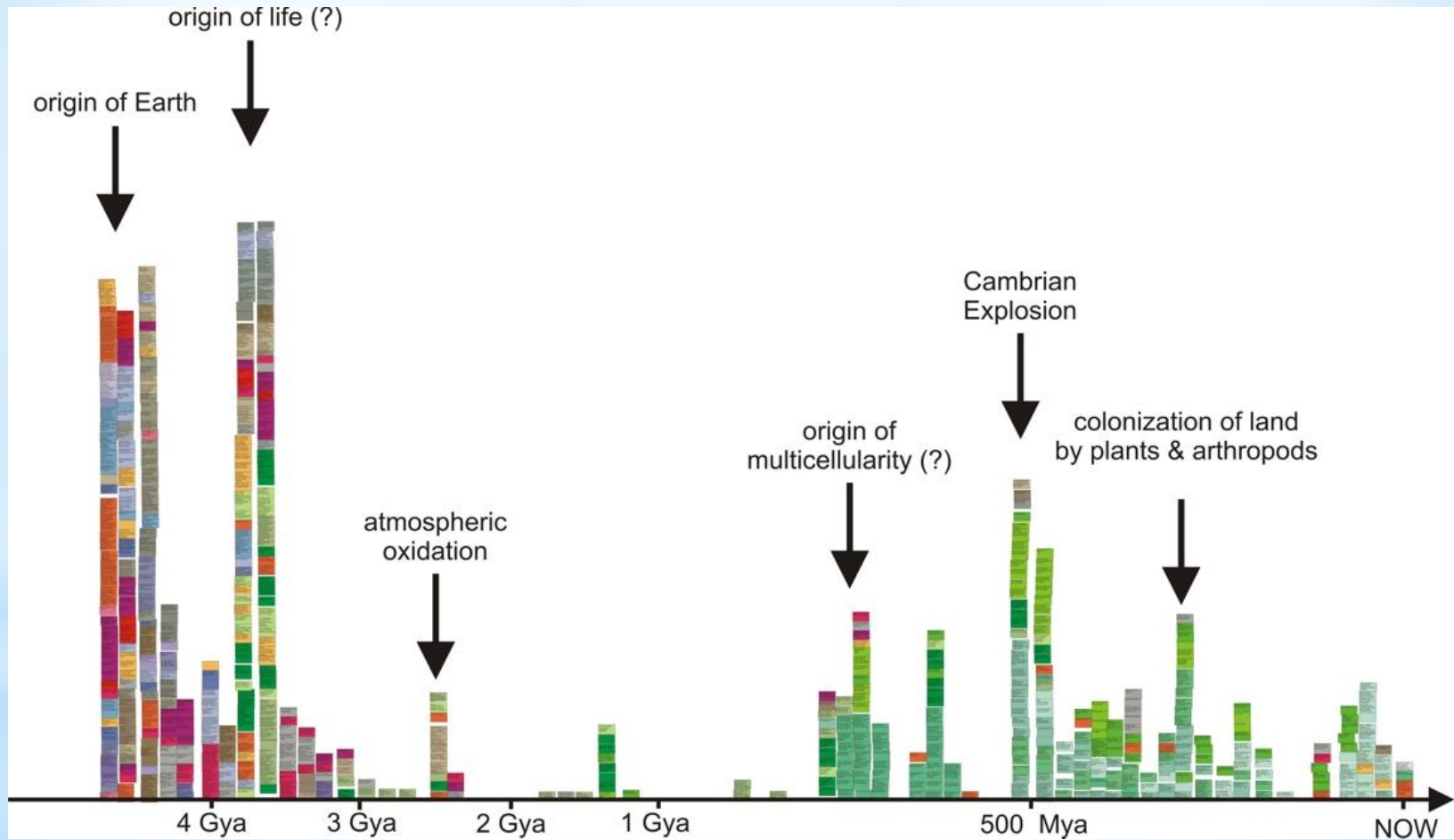


### 3. Micro-macro connection

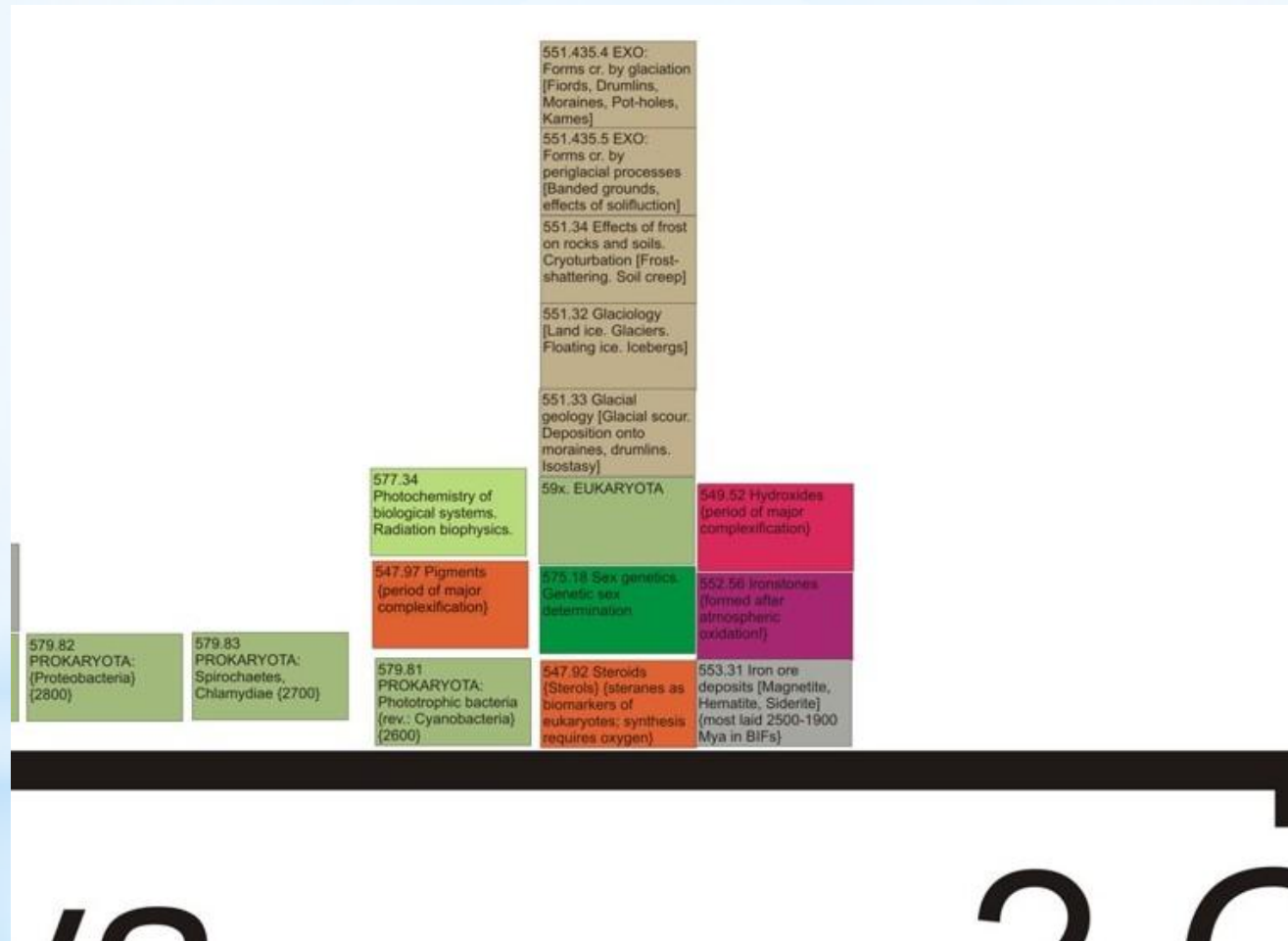




## 4. Global nature of change



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# 5. Perspectives

## 6 APPLIED SCIENCES. MEDICINE. TECHNOLOGY

- + 60 Biotechnology
- + 61 Medical sciences
- 62 Engineering. Technology in general
  - + 62-1/-9 Special auxiliary subdivision for technology in general
  - + 620 Materials testing. Commercial materials. Power stations. Economics of energy
  - + 621 Mechanical engineering in general. Nuclear technology. Electrical engineering. Machinery
  - + 622 Mining
  - 623 Military engineering
    - + 623.1/.7 Land-based military engineering. Artillery
    - 623.8/.9 Naval engineering
      - 623.8 Naval construction. Naval bases. Warships and other vessels
      - 623.9 Material and equipment of naval forces. Protection and armament of vessels. Submarine defences
  - + 624 Civil and structural engineering in general
  - + 625 Civil engineering of land transport. Railway engineering. Highway engineering
  - + 626/627 Hydraulic engineering and construction. Water (aquatic) structures
  - + 628 Public health engineering. Water. Sanitation. Illuminating engineering
  - + 629 Transport vehicle engineering
- 63 Agriculture and related sciences and techniques. Forestry. Farming. Wildlife exploitation
  - + 630 Forestry
  - 631/635 Farm management. Agronomy. Horticulture
    - + 631 Agriculture in general
      - 632 Plant damage, injuries. Plant diseases. Pests, organisms injurious to plants. Plant protection
    - 633/635 Horticulture in general. Specific crops
      - + 633 Field crops and their production
      - 634 Fruit growing
        - 634.2 Stone fruits. Drupes in general
        - 634.3 Rutaceous and moraceous fruits. Citrous fruits in general
        - 634.4 Other pulp fruits
        - 634.5 Nuts



## 5. Perspectives

6th Century BCE:

- Confucius founds Confucianism.
- Laozi founds Taoism.
- Zoroaster founds Zoroastrianism.
- Buddha founds Buddhism.
- Mahavira founds Jainism.
- Thales et al. initiate Greek philosophy.

# Thank you for your attention!

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