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A COMPREHENSIVE APPROACH TO THE CLASSIFICATION OF LIVING WORLD

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This communication is a further elaboration of earlier proposed broad outline classification of the living world by the author which addresses a novel and comprehensive approach of the taxonomy of living world in general. The paper intends to infuse the fundamental ideas regarding the vast majority of living beings including prions, viroids, viruses, bacteria, fungi, lichens, plants and animals in a holistic way, taking their marker characters into consideration. Besides incorporating certain minor changes in the broad outline classification of living world; *Megakingdom Concept of Bioplurity, based on expert comments, it also covers a* discourse on the *`Relict Preserved Hypothesis'* of origin of chemobiotic entities. Furthermore, the plants which nourish the entire living world, have always been a subject of human curiosity in terms of their taxonomy, and thus the major plant taxa have been variously named in the past, based on unscientific grounds, which might have been relevant in those days. But, since the science is rapidly progressing to global and generals, therefore, these stereotypic terms have now become insufficient to focus the real objective. This revisionary work therefore, provides a concrete, comprehensive, self-explanatory and informative new terminology for different major plant taxa in relation to their origin, external and internal complexities, biological specialties and probable phylogeny among themselves.

Key words: Megakingdom, Nomenclature, Prions, *Relict-preserved hypothesis*, Taxonomy.

The most beautiful precept of nature is her variety and variability; at genetic, species and ecosystem levels in the biosphere, underlying diversity and unity as the fundamental themes characterizing all existing life forms ranging from sub-cellular microbial entities like prions, viroids and viruses to demon size plants like *Sequoia, Taxodium* and *Eucalyptus* and animals like *Whale* and elephant. Diversity refers to the difference of magnitudes of characters shared by individuals of a population. It is demonstrable feature of life manifested in life activities in overwhelming array of living world. Over two million species of organisms currently existing and several millions that formerly existed on the earth but extinct now illustrate this. Unity, however less apparent but equally typical to living organisms in their basic characteristics is not as explicit to the casual observer as the diversity, yet exhibited in fundamental life processes like reproduction, transformation and utilization of energy as well as transfer of information from one generation to other or inheritance. Biological systems, no matter how simple or complex, display basic unity in their life processes. The twin themes of diversity and unity often seems to be antagonistic to a common observer, but from the view point of evolution they are exclusive principles each compatible with the other and reconciled as the central dogma of evolution.

The degree of influence of unifying principles decides the direction of evolution and magnitude of diversification. Realizing the same themes of diversity and unity among living beings, Bioplurity is defined as a total variance of biological entities present on the planet earth, which are altogether characterized by reproduction (Pandey 2000).

The concept that life emerged by long and gradual process of chemical evolution was first convincingly set forth by Russian biochemist A.I. Operin (1924) in his enthralling booklet on "The origin of life". The classical experiments of Miller (1953) and Miller and Urey (1959) have established that organic compounds can be formed without the intervention of living

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organisms. Thus, it appears likely that the sea of the primitive earth spontaneously accumulated a rich mixture of organic molecules. In absence of living organisms and oxygen, the organic compounds would have been stable and would persist for countless years. Sidney W. Fox (1965 a, b, c) reasoned that proteins were synthesized from amino acids in the primitive earth by thermal energy. He accordingly heated a mixture of 18 amino acids to temperature of 160-200°C for varying period of times and obtained stable protein like macromolecules and termed these *protenoids*. These thermally produced protenoids were similar to natural proteins in many respects. As a striking instance bacteria can actually utilize the protenoids in culture medium, degrading them with their enzymes into individual amino acids. Equally important when the protenoids cooled and examined under a microscope, it was observed that they were aggregated to form microspheres which might have been the forerunners of the first living cell. However, there remains a large hiatus between the formation of organic microspheres and the appearance of first living cell.

There are various views regarding the chemogeny and biogeny, some believe in the *nucleic acid first hypothesis* however, some in the *protein first hypothesis* but the protein being simpler than nucleic acid, it is logical to believe that it might have formed first due to condensation and polymerization of amino acids. It is most likely that the nucleic acids might have also formed in the same way as the protein through condensation and polymerization of ribonucleotides. Thus polypeptides and polynucleotides might have parallel origin. In reducing primitive atmosphere, these two macromolecules existed for countless years. These microspheres (protenoids) have the property of self duplication and enzyme catalysis, however, the primitive nucleic acid (RNA) has the tendency of autocatalysis, heterocatalysis and mutation. In due course of evolution, the first cell was formed and later the heterotrophic mode of nutrition turned to autotrophic, resulting into the evolution of molecular oxygen which turned the reducing environment into oxidizing one, and brought about the quantum change in existing organisms and environment what is termed *`oxygen revolution'*.

Before the oxygen revolution, free protenoids and ribonucleic acids would have been present in the primitive sea. But later these would have been subjected to environmental oxidation and destruction by micro organisms; however, those which either came in close association to form nucleoprotein or entered into other existing organism were protected. In this way, three evolutionary lines started producing three basic types of sub cellular chemobiotic entities *viz.* prions, viroids and viruses. Considering the chemogeny, biogeny and phylogeny, Pandey (2000) proposed a broad outline classification of the living world entitled "Megakingdom Concept of Bioplurity" of which a revised key, as per the expert comments with an outline sketch thereof (Fig. No.1.0) is given hereunder.

DISCUSSION AND RESULTS

1. Origin of Chemobionts (Prions, viroids and viruses)

The members of the kingdom *Chemobiontae* are on the threshold of life; they do not have any cellular organization but exhibit the properties of living and non-living. It is a matter of great controversy that whether they are primitive or highly evolved super parasites. If we go through sheer analysis of logic and chemistry, the facts become quite clear that these sub cellular chemobiotic organisms share both the properties of being primitive as well as highly evolved super parasites. As far as their primitiveness is concerned, their structural organization is a sufficient testimony. However, in view of utilization of matter and energy they are very much conservative and economical, which establishes their highly

I. CHEMOBIONTAE

KEY TO DIVISIONS OF CHEMOBIONTAE (Suffix idae)

1. + Biochemical entities consisting of 1, 2 or 3 protein molecules (prions) ----------*Polypeptidae*

   - Biochemical entities consisting of a nucleic acid or nucleoproteins…….……2

2 + Biochemical entities consisting of a naked RNA fragment (pathogene) ----------*Ribonucleoidae*

   - Biochemical entities consisting of nucleic acid and proteins----------*Nucleopolypetidae*

II. PROCARYOBIONTAE

KEY TO DIVISIONS OF PROCARYOBIONTAE (Suffix iae)

1. + Cell wall contains proteins & polysaccharides; cell membrane contains a single layer of branched chain lipids----------*Archaebacteriae*
   - Cell wall contains peptidoglycan, cell membrane contains a bilayer of phospholipid arranged tail to tail……..2
2. + Organisms achlorophyllous, some contain bacteriochlorophyll, photosynthesis non oxygenic----------*Eubacteriae*

- Organisms chlorophyllous, photosynthesis oxygenic ----------*Cyanobacteriae*

III. Eucaryobiontae

KEY TO SUB-KINGDOMS OF EUCARYOBIONTAE (Suffix oidae)

1. + Organisms simple heterotrophic decomposers----------*Mycetoidae (1)*
   - Organisms simple or complex autotrophs……...……2
2. + Organisms body synthetic, symbiontophototrophs----------*Symbiontoidae (2)*
   - Organism photoautotrophic producers or holozoic consumers…….…..3
3. + Organisms photoautotrophic producers----------*Phytoidae (3)*

   - Organisms holozoic consumers----------*Zooidae (4)*

(1) MYCETOIDAE

KEY TO DIVISIONS OF MYCETOIDAE (Suffix mycota)

1. + Assimilative phase plasmodium or pseudo plasmodium----------Myxomycota

- Assimilative phase typically filamentous----------Eumycota

(2) SYMBIONTOIDAE

This sub-kingdom consist of single division Mycetophycophyta known so far, characterized by the presence of fungal and algal association in the body organization and autotrophic mode of nutrition. However, if some other symbiotic associations are discovered in future, they can also be properly accommodated in this sub-kingdom.

(3) PHYTOIDAE

Key To divisions of sub-kingdom *Phytoidae (Suffix phyta)*

1. + Plant body undifferentiated into root and shoot systems, mostly aquatic, vascular organization non specific, sex organs unicellular and unprotected ---------- *Atracheophyta*
   - Plant body differentiated at various degrees, amphibious or terrestrial, vascular organization

variously specified, sex organs multicellular protected within a jacket of sterile cells .....….. 2

2. + Plant body least differentiated, mostly amphibious, vascular organization absent or least specified---------- *Protracheophyta*

\- Plant body well differentiated, mostly terresterial, vascular organization primitive or very advanced type, embryo poorly or highly protected…….……..…. 3

3. + Vascular organization primitive, embryo poorly protected---------- *Prototracheophyta*

\- Vascular organization advanced, embryo protected within seed or fruit…….…..… 4

4. + Xylem lacks vessels and phloem companion cells, embryo protected within naked seed (carpel absent) ---------- *Acarpophyta*

\- Xylem with vessels and phloem with companion cells, embryo protected within covered seed (carpel present) ----------*Carpophyta*

(4) ZOOIDAE

Key To divisions (=PHYLA) of ZOOIDAE (Suffix zoa)

1. + Body organization unicellular----------*Protozoa*

\- Body organization colonial or multicellular……..……2

2. + Body organization colonial----------*Parazoa*

\- Body organization multicellular----------*Metazoa*

evolved super parasitic nature.

Considering overall features, it can be concluded that the chemobiotic organisms might have originated through *Relict Preserved Method.* Because most of their contemporary protenoids and the nucleic acid (RNA) would have been destroyed by environmental oxygen and existing microbes while those which came under biological interactions with hosts were preserved and the present day prions, viroids and viruses came into existence.

Further it is predicted that viruses might have evolved into different types of procaryotes, taking part into the main stream of evolution because of being equipped with nucleic acid and protein simultaneously, which are the very basic requirements of metabolism. However, the prions and viroids failed to come in the main stream of evolution because of being incapacitated to precede the life functions due to the required inadequacy of organic chemicals. In this way, we have enough factual interpretations to predict that these submicroscopic biochemical species might have rather lately originated after the beginning of first life and even after the autotrophy came into existence. In due course of evolution, these chemobionts got very well adapted with metabolic machinery of host and could not develop their own independent metabolic machinery, therefore, remained confined as obligate pathogen rather than parasite.

It is quite interesting to note that unlike other procaryotes and eucaryotes, chemobionts do not exploit the metabolic machinery of their hosts for the transformation and utilization of energy, but they take over their genetical systems and biochemical pool only for the transfer of information from one generation to other through the process of multiplication. The author's *Relict Preserved Hypothesis* of origin of chemobiotic entities is therefore attractive and logical, as it is based on the terra firma of experimental chemistry and biology

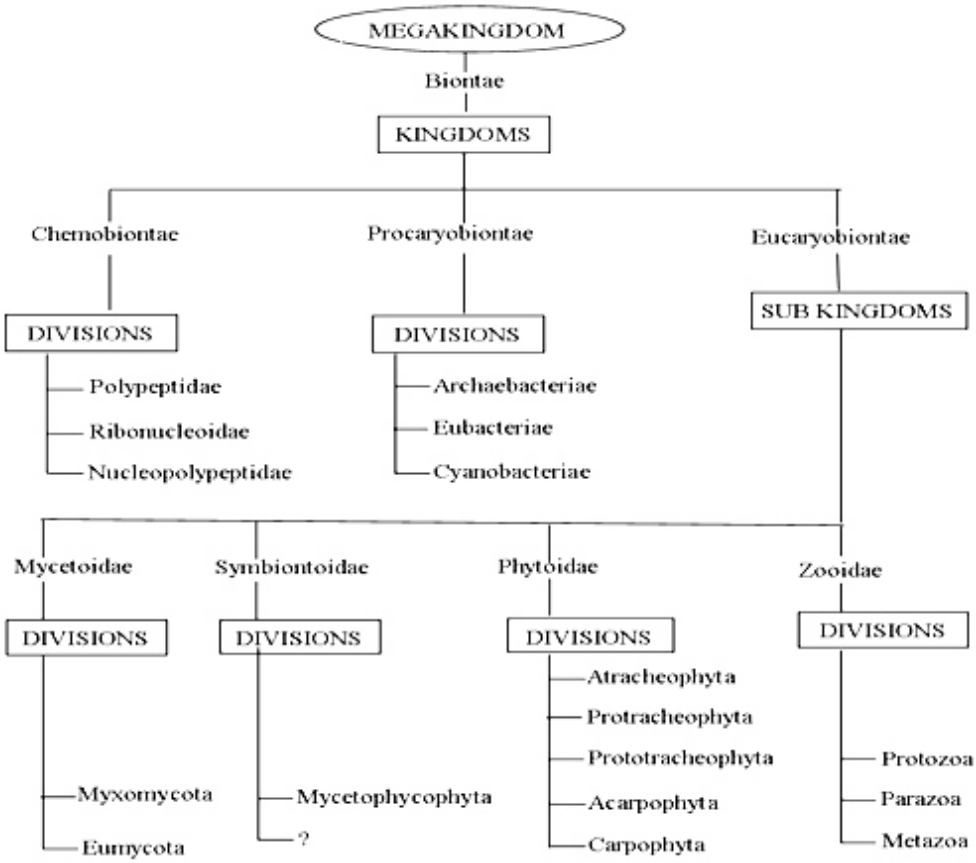

Fig. 1.0 Megakingdom Concept of Living World

(Fig. No. 2.0).

The plants that occupy unique position in nature were created much earlier than the descent of man on this planet and have always been a subject of human curiosity in terms of their taxonomy. For the communicative crystallization of plants into words; their structural organization, mode of nutrition and roles in ecosystem are some of the most fundamental criteria, which can define a plant as "a eukaryotic, photoautotrophic producer organism". The major plant taxa have been variously named in the past, based on unscientific grounds which might have been relevant in those days. But, since the science is rapidly progressing to global and generals, therefore, these stereotypic terms have become insufficient to focus the real objective. Eichler (1883), a German botanist proposed a widely accepted classification where he divided plant kingdom into two major groups as follows:

Plant Kingdom

Group-I: *Cryptogamae* (Non seed plants)

Divisions: 1. *Thallophyta*

Classes: (i) *Algae*

(ii) *Fungi*

2. *Bryophyta*

3. *Pteridophyta*

2. Group-II: *Phanerogamae* (Seed plants)

Divisions: 1. *Gymnospermae*

2. *Angiospermae*

Later the system was modified and four major groups; *Thallophyta, Bryophyta, Pteridophyta*

and *Spermatophyta* were recognized as major divisions of plants and the terms were widely adopted by botanists. But doubts have been expressed about the validity of *Thallophyta, Pteridophyta* and *Spermatophyta* as the natural divisions of plant kingdom. Although these terms are widely accepted by botanists yet they are without meaning for non botanists as well as learners of botany.

On the basis of marker characters, with highest correlative value and taxonomic coefficient such as structural organization, nature of vascular anatomy, protection provided to female gamete or embryo and overall probable phylogeny, Pandey (2000) systematically place the plants into the sub-kingdom P*hytoidae (=Plantae)* under kingdom *Eucaryobiontae* in his scheme of classification of living world.

Now in this paper, the sub-kingdom P*hytoidae is further classified* into five divisions (refer to key) as follows;

Megakingdom - *Biontae* (Power of reproduction)

Kingdom - *Eucaryobiontae* (Eucaryotic body organization)

Sub-kingdom - *Phytoidae* (Photoautotrophic producers)

. **Divisions -** 1. *Atracheophyta* (=Algae)
2. *Protracheophyta* (= Bryophyta)
3. *Prototracheophyta* (= Pteridophyta)

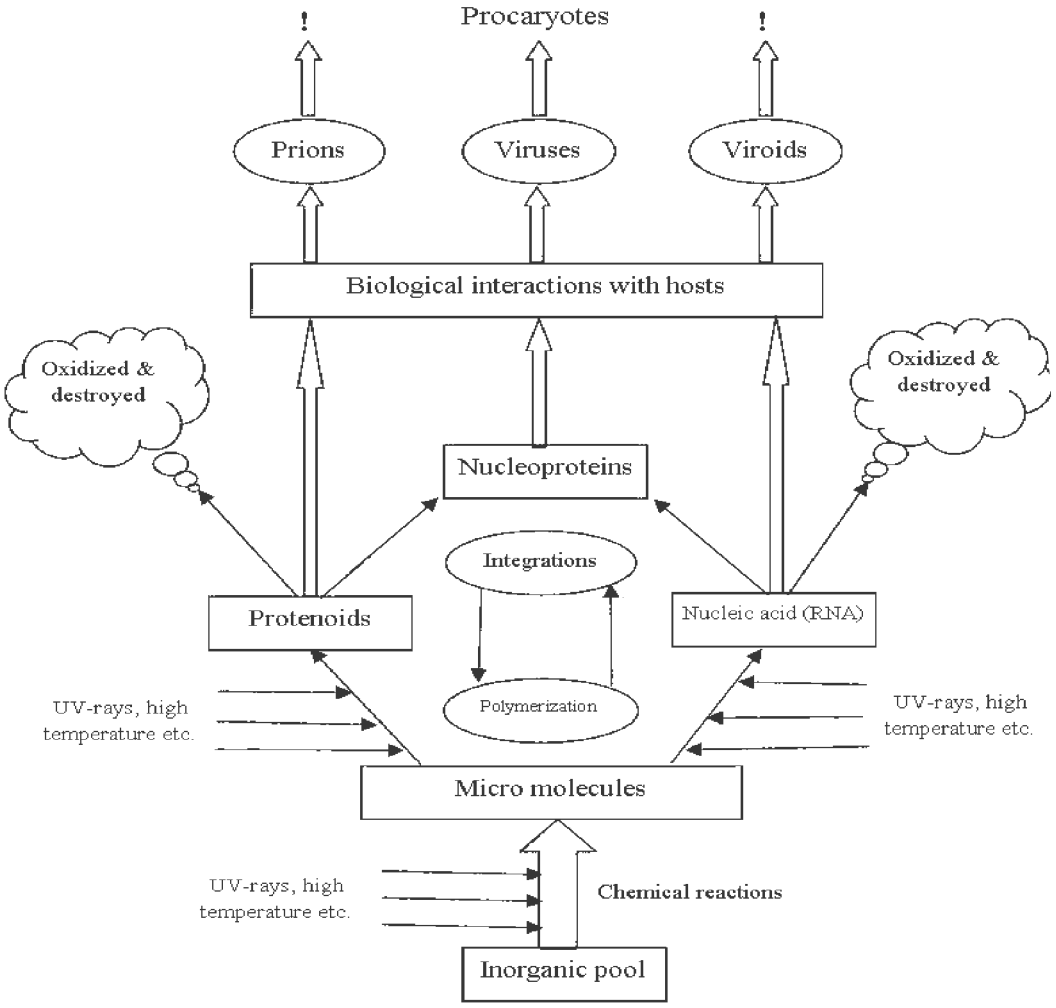

Fig. 2. 0 Probable Origin of Chemobionts

4. *Acarpophyta* (= Gymnospermae)
5. *Carpophyta* (= Angiospermae)

In this submission, the newly proposed terminologies for major plant taxa have following merits:

1. The terms are comprehensive, descriptive, exact in meaning and informative in nature.
2. They represent general pattern of advancement in structural complexity.
3. They reflect the nature and evolution of vascular anatomy.
4. Terms have vested consideration of protection rendered to female gamete or embryo during the course of evolution.
5. Terms are embodied with phylogenetic pattern in the origin and evolution of land plants.

As a matter of fact, the nature never creates organisms to be fitted in the manmade pigeonhole, however, the naturalists rather taxonomists always attempt to practice this based on their intuitive and perceptive faculties. Disappointments are therefore natural in the process of classification of organisms. Moreover, categorization of organisms under the principle of subordination is a natural law that has to be followed for the greater feasibility and assessment of natural spectra of biological variety and variability. Although this approach is a comprehension of the existing biodiversity with the interest to develop a holistic idea of living world in the mindset of readers, yet the outlooks of experts may differ. In my opinion, the taxonomy is currently facing lots of hurdles due to the ignorance of weighting of characters and consequently getting hazy in meeting its objectives. Everyday a new taxon is being created on the basis of sporty characters, usually not assessable to common observers, which is dragging this branch of fundamental science towards a black hole. The only ray of hope that seems to rescue taxonomy against this crusader action is to emphasize the comprehensive approach, where marker or key characters are highly valued, because of their maximum correlative property and higher degree of taxonomic coefficient.

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