Aesthesis of the Shri Institute, 2nd Article, 27th September – 19th October, 2023

Novelty: Pyramid of Emergence in Evo-Devo of Flowers & Continuous Emergent Quasi-Species Equations

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Introduction

Classically, protein gradients in developmental stage cells are employed to explain development of different organisms. The article includes emergence of novel layers in developmental gradients to explain the differentiation. It takes the quasi-species equation of the abundances of evolvers with continuous index & defines quasi-species equation for the evolving continuous index itself. It includes variation by means of emergence in the mutation term to transform developmental gradients into emergent layer-gradients to explain the origin-innovation to determination & differentiation in the evo-devo of the flower systems as a model.

1. Krishna-Kamal (*Passiflora sp.*)

Figure 1Fig.1 Krishna Kamal Flower

Dry Slides of Floral Parts :- Dry, Compound Microscope, 100x, except pollen grains & petal like processes under 1000x;

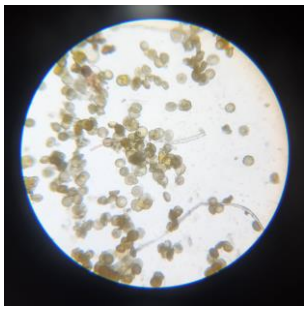


Fig.2 Krishna Kamal Pollen

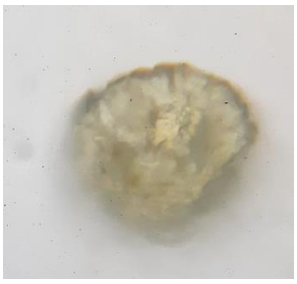


Fig.3 Pollen Grain, 1000x

Fig.4 Pollen Grain, 1000x

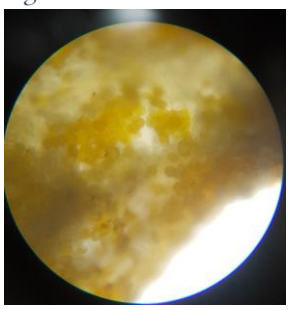


Fig.5 Anther

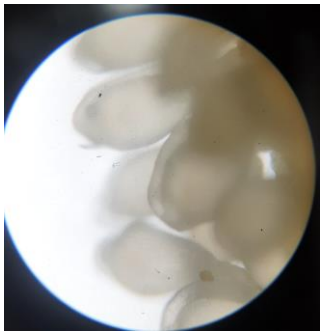


Fig.6 Ovary Vertical Section

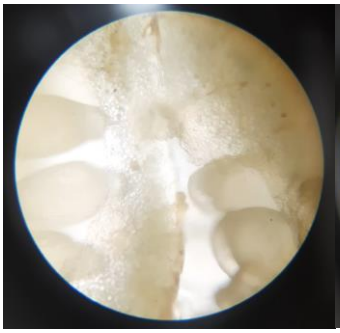


Fig.7 Ovary Cross Section

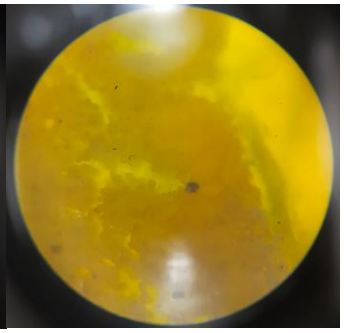


Fig.8 Stigma & Its Junction with Style

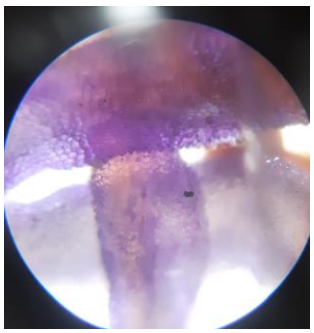


Fig.9 Petal-like Floral Process

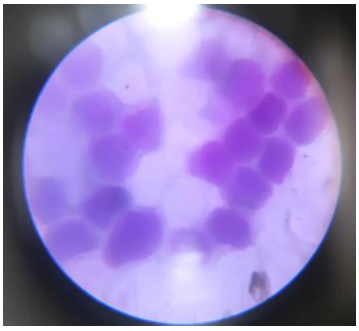


Fig.10 Petal-Like Floral Process, 1000x

Notes on Sporophylls of Passiflora sp. above:-

1. Left, Submissive, Secret mega- & micro-sporophylls facing the flower below;
2. Top/Higher Ad-Sporophylls, adfloral-admasculine megasporophylls facing the flower below;

   Stigma & Style- 3 styles x 2 x (2 x one lobe) = 6 mono-styles x bilobed stigma
   Stamens- 5 x stamens
   Stigma-styles & Stamens form unsaturated complemented organization rather than possible saturated alternate complemented organization;
   Divergent (1 x 2 x 2 + ½* (2 x any 1 of 4)) = k-staminal = 5,
   (1 x 2 x 2 + ½*(2 x any 2 of 4)) = k-stigma-stylic = 6;
   sorting & synned evo-devo of the divergence;
   Soma-germa axis – pyramid scheme of evo-devo- germa to soma extension hypothesis;
   Whorl number magnitude & variation is very high;

2. **Quasi-Species Equation of Origin & Innovation**
   Consider a quasi-species evolutionary system with following variables-

k_t: *maximum of the index k at time t*
τ: *maximum of the index t at time* $t = \tau$

$x_{k,t}$: *abundance of kth instance of m at t*
$f(x)_{k,t}$: *fitness of* $x_{k,t}$
m_t: *total m kinds of k instances indicated at t*
cm_t: *copiousness of* m^{th} *kind of k instances* at t
$k(c,m,t)$:
maximum value of k at time t as function of copiousness c of k^{th} *instance of* m^{th} *kind at time t,*
$m(c,m,t)$: *m, the kinds of instances k as a function of* c, m & t;
Functions of c, m, t:
$\mathrm{cm}(c,m,t)$, *copiousness c of m at t,*
$g(c,m,t)$ *genesis ,*
$\mathrm{mut}\ (to)(c,m,t)$ *variation due to mutation &/or emergence etc.* (*to the indicated*)
$\mathrm{stay}(c,m,t)$ *stasis*

& this quasi-species equation-

$$\frac{dx_k}{dt} = \int_0^{k(c,m,t)} x_{k,t} \cdot f(x)_{k,t}\left((stay \ \vee \ mut\ to)x\right)_{k,t} dk \ldots\ldots [I]$$

When quasi-species index k in the replicator-mutator equation [I] without carrying capacity above, is continuous by mechanisms including the unifying evolutionary aesthesis

theme(see the Evolutionary Framework & Aesthesis in Angiosperms research proposal from archive), & dynamic, by means of mutational &/or emergent & selectional innovations or increments to the quasi-species set with their own abundances, null to all, we could write the quasi-species equation for the index of indicated quasi-species. This could take following form for unbound continuous system without carrying capacity & conjectured, (Conjecture 1), resolved at final phases of origin to ultimate axis & thus, equal abreast final &/or ultimate fit components leading to additive & thus, multiplicative terms-

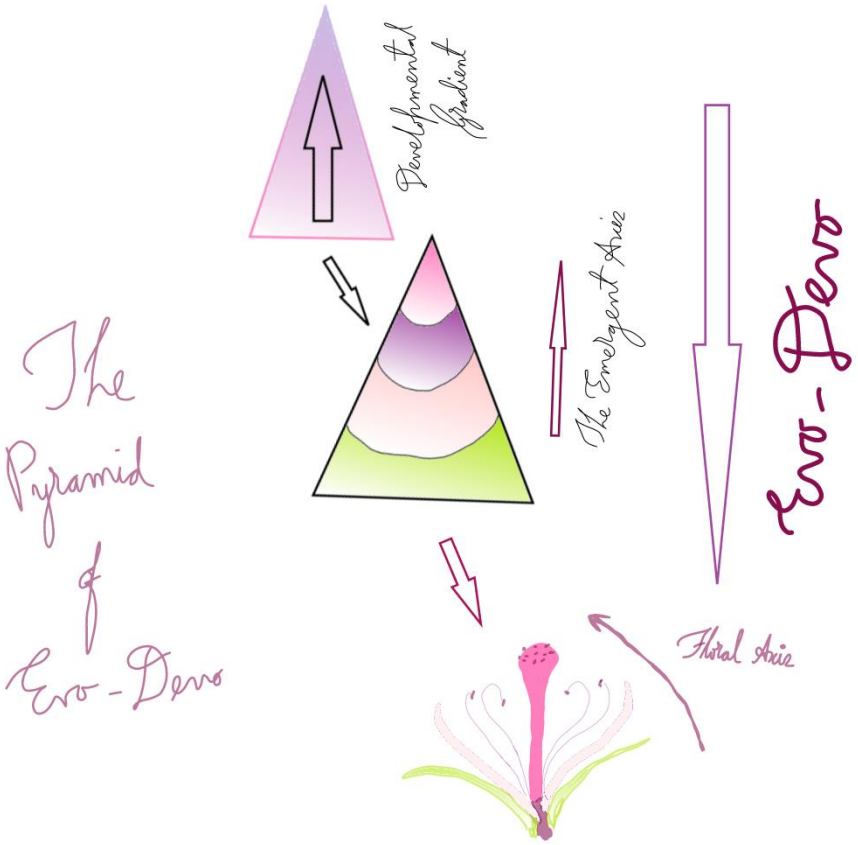
$$k_t = \int_0^{m_t} cm_t \, dm = k(c,m,t)$$

$$\coloneqq \int_0^{\tau} \int_0^{m(c,m,t)} \mathrm{cm}(c,m,t) \cdot g(c,m,t) \cdot (\mathrm{mut}(c,m,t) + \mathrm{stay}(c,m,t)) \, dm \, dt$$

$$\coloneqq \int_0^{\tau} \int_0^{k_t} \frac{dx_k}{dt} dt = \int_0^{\tau} \int_0^{k_t} \int_0^{k(c,m,t)} x_{k,t} \cdot f(x)_{k,t} \cdot \left((stay \ \vee \ mut \ to)x\right)_{k,t} dk \, dt \ldots\ldots [II]$$

The innovation in m is by means of origin from 0, mutations, emergence & selection in prior m's, including m_0 , the first m value, & $m = cm = (m \cdot cm) = k = 0$.
The internal structure of cm, g & mut, stay is defined by fundamental positivity-fitness-aesthesis of the system locus & dynamics & specialization to the respective term-entities in the system. This way, just the unique position vector & its unique specialization coefficient to the maximum positivity, of the system in positivity-neutrality-negativity axis shall provide the full respective unique value of the function. The algebra of higher positive system entities would reflect in, co/by-locate & integrate with their lower derived values to magnitudes. For the non-value partial selves of system entities exhibiting Conjecture 1 of resolutional additivity-multiplicity of the final fits, the values of such resolvable entities are resolvable sooner as they are generally more final & like reflection of & co-located-integrated with the resolved final partial selves, than the otherwise with respect to the Conjecture 1 leading to complete resolution. This could be the mathematical ontogeny recapitulating the phylogeny integrating its axial flavor.

3. Quasi-Species Theory Applied to the Flowers



The continuous anatomy could equate continuous m & k. This m & thus, k could increment by origin & innovation circularly &/or concentrically e.g. by means of duplications with mutations & emergence of new levels along the evolutionary developmental axes of the flower or alike. The pyramidal nature of *Epiphyllum oxypetalum* whorls indicates likely pyramidal emergence developmental mechanism. The quasi-species equation II above could apply to the whorls as well as sub-whorl parts- e.g. petals, anthers, stigmata etc. Their evolutionary developmental diversion could be indicated by unshared m & k dynamics & trajectories as in pentamerous stamens & bi or tetra stigmatic three pistils of the *Passiflora sp.*(see section 1). The synevolution of elements/leaves to whorls to spores would support soma - germa axis bifurcating into sexes through to flowers & spores, in their evo-devo.

The formed quasi-species could be transferred to sub-systems (e.g. from bilateral *Epiphyllum oxypetalum* leaf to its radial flowers) & sub-sequentially (*Epiphyllum oxypetalum* flower to staminescence to likely, anther stalks). This could be recursion at levels of the pyramidal scheme of evo-devo.

Ovaries are far too inside the floral tube as are anther stalk fibers continuing resolved very deep. This might indicate elongation of floral tube by the pyramid scheme with

pollination evolution. The length indicates long scale interactions & processes. Multiple rounds of concentric increment using the pyramidal evo-devo is supported in the whorls organizing into pyramidal form centripetally. The elongation & concentric emergence might have accompanied a general extension process.

Highly varying, high magnitude whorl element number both incrementing & decreasing non-monotonically towards the center of the *Passiflora sp.* indicates highly active evolution. Mutation could be random, however, emergence might be more definitely present in the evolutionary systems. The $\mathrm{mut}(c, m, t)$ thus would have higher magnitude than when emergence was rare & random.
Very high copy number of whorl elements from ovules, stamens & petal group of elements in the *Epiphyllum oxypetalum*, quite monotonically increasing centripetally to singular integrated aesthetic center, might indicate extra-ordinary evolutionary potential & effect.

The functions $\mathrm{g}(c, m, t), \mathrm{mut}(c, m, t)$ could be rates of exponential & Poisson processes, respectively. They could be influenced by biological factors like niche-geometric, anatomical & morphological scope for increment & emergence, e.g. more favored Circular Vs. Centripetal/Centrifugal mode of increment-emergence characterizing the g & mut + stay functions.

4. Conclusions

Emergence could be investigated for its role in explaining evo-devo. Continuous Emergent Quasi-Species Equation (CEQSE) presented here could be specialized for model taxa & analyzed for evidence of support. CEQSE could help explain whole genome duplication mediated evolution & similar instances of evolving indices like whorl & whorl element indices. Morphanatomical data could be used to derive evolutionary potential & initial conditions. The evolutionary profiles could be compared to find divergence on the evolutionary-developmental axis. *Aesthetically & Philosophically,* unbound infinite eternal or afferent-conserved & selected, ideal & idealizing prior, origin & innovation could be described & modeled by CEQSE.