The Uniformitarian Theory of the Origin of Insect Flight

Proposed: The source of insect wing motion (but not of wings) is a mechanism for sound production.

1.Uniformitarianism

This proposal has a uniformitarian basis: it demonstrates that the source of insect flight motion may still be an observable and active part of insect behavior.

2. The potential mechano-acoustic properties of the insect cuticle are well known

Insect cuticle, a stiff, elastic lamina has ample capabilities for generating sound. Insects universally use elements of the cuticle for this purpose. Numerous examples of this process can be found in the literature.

3. The flight motor

Wing vibration rates differ among insect types, but the alternating upstroke-downstroke wing motion is in all cases driven by a vibrating resonator. Importantly, if the wings are disregarded, a fully functional oscillating mechanism stands extant within the thorax. The flight motor without wings is a vibrator! A bee with wings immobilized still buzzes.

4. Selective advantages of sound making combined with display

Would pre-flight insects need a vibrator? Very likely. Insect communicate visually, pheronomally and sonically, and for all of these there is a plethora of examples. But before acquiring flight insects would especially rely on sound communication since their visual depth is rather limited (having short focal length lenses), and, except in swarming, would have a degree of difficulty finding each other in the substratum of stones and plants, and at a distance, etc. The wings of today's insects are themselves sonifiers: mosquitoes, for instance can differentiate between species and mates through wing vibration rates. Primitive sounds could have been merely single clicks and ticks, but under selective pressure would evolve into rhythmic pulses and phrases of suitable volume.

5. An inevitable conclusion

The origin of the wing surfaces was most likely for display, and could have derived from sources, such as movable gills of an aquatic insect, as in the epicoxal theory proposed by Kukalova-Peck, or from appendages growing from the insects legs, according to the epicoxal-exite theory. If we suppose that such a wing surface, of whatever source, becomes connected to a sound vibrator in the thorax of an insect, then we can see a possible origin of the mobile wing. Through selection the relevant insects would evolve aerodynamic wing behavior and attain lift and later controlled flight.

Thus, the present theory offers a uniformitarian explanation: the sources and actions that originated insect flight still exist in the present day.