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"Evolution Canyon": the "Israeli Galapagos"

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"Evolution Canyon" Model

Can we follow today the *active origin of species*? The "Evolution Canyon " (EC) model (1) is a *micro*-scale natural laboratory that highlights the *sympatric speciation model* of the origin of species, suggested by Darwin in his masterpiece of 1859, and remaining controversial to date. The evidence we assembled since 1990 on the EC model, now extended to four such *micro*-sites (Carmel, Galilee, Negev, and Golan Mountains), is based on functional ecological genomics, proteomics, and phenomics (1, 3). At EC I, Mount Carmel, we studied 2500 species in 7000 m^2, from bacteria to mammals. In five model organisms across life, including soil bacteria, wild barley, beetles, fruit flies and spiny mice, we showed *incipient sympatric ecological adaptive speciation* (4,5). All five model organisms display *evolution in action* of *microclimatic adaptation* and *incipient sympatric ecological adaptive speciation* with ongoing gene flow. Incipient speciation occurs on the *tropical* and *temperate* abutting slopes separated, on average, by only 250 meters. (See live model organisms below)converge in their *micro*-climatic adaptations to the hot and dry savannoid "African", south Facing Slope (SFS or AS), and, by contrast, on the opposite slope, converge on the cool and humid "European", north –facing slope (NSF or ES). Natural selection over-rules ongoing *inter-slope* gene flow between the free interbreeding populations, *within* and *between* slopes, and leads to *adaptive incipient sympatric ecological speciation* on the dramatically abutting, *xeric* savannoid and *mesic* forested, slopes. The EC model is analogous, as a cradle for the origin of new species, to the Galapagos islands, but *sympatrically,* not *allopatrically.*

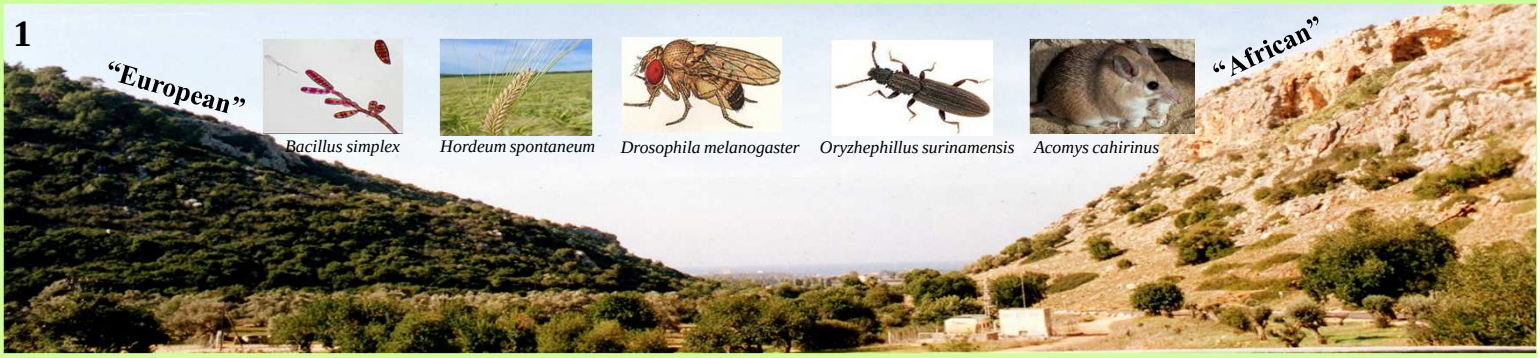
Incipient Sympatric Ecological Adaptative Speciation at "Evolution Canyon"

The five model organisms are: (1) *Bacillus simplex*, (2) wild barley (*Hordeum spontaneum)*, (3) the tiny beetle *Oryzaephilus surinamensis*; (4) cosmopolitan fruit-fly *Drosophila melanogaster*, (5) African originated spiny mice, *Acomys cahirinus*. All five model organisms display *evolution in action of microclimaic adaptation and incipient sympatric ecological speciation* on the hot and dry tropical and cool and humid temperate abutting slopes.

Conclusions and Prospects

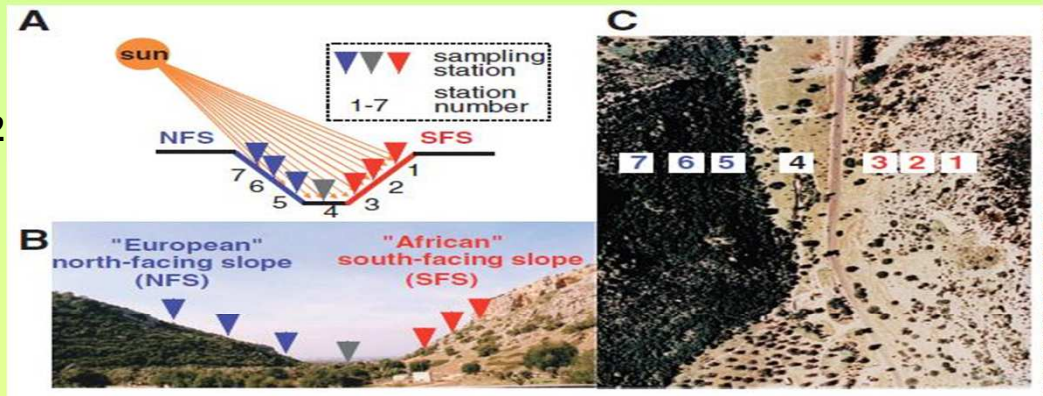
Natural selection overrules ongoing interslope gene flow between free interbreeding populations and leads to *incipient sympatric ecological speciation* on the dramatically opposite abutting savannoid and forested abutting slopes. More model organisms await analysis.

1



Evolution Canyon I, Mount Carmel: Crossection

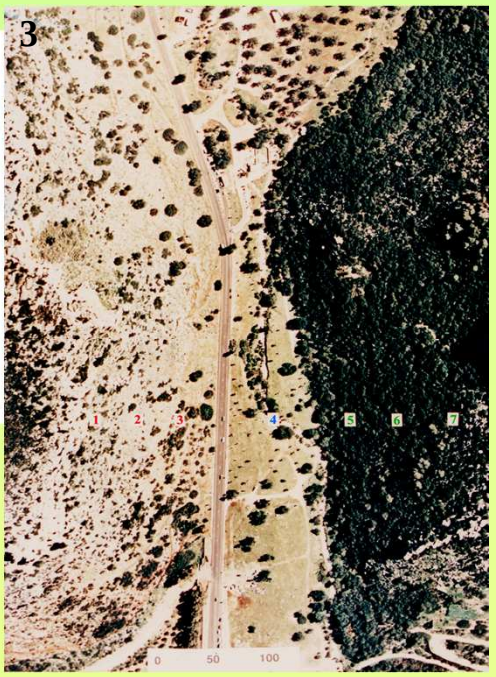
2



Evolution Canyon model in Israel. A represents the microclimatic model. B shows the cross section of the "Evolution Canyon (EC). C represents an air view of EC. The sharp divergence of savanna and forest habitats are seen in both the cross section of "Evolution Canyon" (EC) in B, and its air view in C. Collecting stations nos. 1-3 on the "African", tropical, savannoid south - facing slope and stations nos. 5-7 on the abutting "European", temperate, forested north- facing slope are seen in both A and C (From Sikorski and Nevo, 2007).

Evolution in action of adaptation and speciation-with-gene-flow across life at "Evolution Canyon", Israel IJEE (in press)

3



"Evolution Canyon" Mount Carmel: Air view