Innovators and imitators: how environmental bacteria conquest new chemical spaces

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The still-evolving 2,4-dinitrotoluene (DNT) pathway of *Burkholderia cepacia* R34 will be discussed as a case of emergence of new metabolic capabilities in environmental bacteria. *In vivo* reactions indicated that reactive oxygen species (ROS) generated by the faulty (i.e. uncoupled) reaction of the precursor enzymes with DNT elicit genetic diversification. This could in turn ease the solution of the biochemical and physiological problem. These observations provide a view of evolution as a sort of *heterotic computing* in which the problem is embodied in the physicochemical frame of the cell and the exploration of the solution space is pushed by its endogenous dynamics. On this basis, it is plausible that some members of a given microbial community are prone to innovate their metabolic capacities much faster than others while the rest may benefit from such innovation through horizontal gene transfer.