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van Baal's legacy: From renormalons to bions

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This talk presents a summary of our current understanding of confinement problem in non-abelian gauge theories. It is dedicated to the memory of Pierre van Baal, who contributed to the field significantly.

I will review recent semi-classically calculable realization of confinement in various gauge theories. In particular, I will describe the role of monopole-instantons(realized by van Baal), and their role in neutral and magnetic bions, and the relation of these semi-classical saddles to 't Hooft's elusive renormalon problem. The techniques I describe uses resurgence theory, and related Lefschetz thimble (homology cycle) decomposition of path integrals.

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