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Spatiotemporal patterns of voltage and calcium signaling in heart cells and tissue

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This talk will describe recent progress made in understanding oscillatory patterns of voltage and calcium signals that precede the onset of electromechanical wave turbulence in the main chambers of the heart. Results will illustrate how both physiologically detailed and abstract models have proven useful to cope with the bewildering molecular complexity of cardiac biology and to bridge phenomena on cellular and tissue scales. A main conclusion is that those oscillatory patterns can be self-organized, resulting from symmetry-breaking linear instabilities, or/and a manifestation of underling tissue heterogeneities. Thus studying the evolution of those patterns provides a valuable indirect probe of complex physiological processes that render the heart susceptible to the sudden onset of lethal heart rhythm disorders.