Emergence Of a Line-Defect and its Subsequent Transitions in a Period-2 Oscillatory Medium.

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In this lecture, I will review recent experiments that investigate the instability of a period-1 (P-1) spiral wave resulting in a period-2 (P-2) spiral. The subsequent bifurcations of the underlying line-defects will be also discussed. Intriguing dynamics of line-defects underlying the period-2 spiral waves are observed and quantified for the first time in an experiment employing a Belousov-Zhabotinsky reaction-diffusion system. At the very onset of the P-1 to P-2 spiral wave transition, a spiraling line-defect that ``breathes'' intermittently in time but retaining the symmetry of a period-1 spiral wave in space emerges. With a further change in a control parameter, this spiraling line-defect transforms its shape as the spiral core undergoes a meandering transition producing a complex compound tip trajectory. Further away from the onset, a complex dynamical state intermingled with moving P-1, P-2, and P-3 domains emerges. The local dynamics of the complex state has a low dimensional chaotic nature. The emergence and decay of bubble-shaped line-detects will be discussed as well. Similar observations are made in model reaction-diffusion systems and they will be compared with the experimental results.

References:

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