

## MATHEMATICS COLLOQUIUM UTRGV – SPIE Visiting Lecturer

## Dissipative Solitons in Optical Fiber Systems

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**Abstract:** We introduce the concept of dissipative solitons, which emerge as a result of a double balance: between nonlinearity and dispersion and also between gain and loss. Such dissipative solitons have many unique properties which differ from those of their conservative counterparts and which make them similar to living things. We focus our discussion on dissipative solitons in optical fiber transmission lines and lasers, which can be described by the cubic-quintic complex Ginzburg-Landau equation (CGLE). In the field of nonlinear optics, the CGLE can describe also several other systems, namely optical parametric oscillators, free-electron laser oscillators, and all-optical transmission lines.

To fully explore the CGLE, massive numerically simulations must be carried out. Different types of soliton solutions are obtained in this way, which can be divided in two classes: localized fixed-shape solutions and localized pulsating solutions. Among the localized pulsating solutions, we may refer the plain pulsating and the creeping solions, as well as the erupting solitons, which belong to the class of chaotic solutions. The existence of the erupting solitons has been experimentally confirmed in a passively mode-locked solid state laser, where the higher-order effects might have some influence. The possibility of converting the localized pulsating solitons into fixed-shape pulses under the influence of some higher-order effects, as well as the possibility of formation of dissipative soliton molecules will be discussed.

Date: Friday, December 9, 2016 Time: 4:00pm - 5:00pm Place: MAGC 1.302

Refreshments will be served at 3:50pm. For further information, or for special accommodations contact Dr. Zhijun Qiao via email at zhijun.qiao@utrgv.edu or at 956-665-3406.