**Friday, March 13, 2020**

**4:10 – 5:00 PM**

**Barnard Hall (EPS) 103**

**McCall-Hahn solitons (self-induced transparency) in ruby - revisited  
or How to avoid solving partial differential equations**

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http://www.physics.montana.edu/arebane/rebane/index.html

**Abstract:**

Wikipedia defines soliton or solitary wave as a self-reinforcing wave packet that maintains its shape while it propagates at a constant (group) velocity. Solitons are caused by a cancellation of nonlinear and dispersive effects in the medium, and are known to occur in a variety of physical systems from shipping channels to optical fibers. McCall-Hahn solitons also known as self-induced transparency (SIT) takes place when light propagates in a nominally strongly absorbing medium, but suffers virtually no energy loss.  Even though SIT is known in optics literature since 1960ies, it is still an intriguing phenomenon, especially in view of technological need for optical memories, switchable delay lines etc. My interest was inspired by a recent SIT experiment performed in cryogenically cooled ruby crystal by my collaborator Hans Riesen at the University of New South Wales (Australia), and where a surprisingly simple model calculation achieved quantitative match with the soliton pulse shape data without solving partial differential equations normally associated with describing formation and propagation of solitons. During my sabbatical leave, in the AY 2018-2019, I performed some further numeric simulations of SIT in ruby, seeking answer to questions such as “What happens to information originally coded in the incident pulse shape?” or “Would single photons also form solitons?”.

# Host:

# Randy Babbitt

***\* Refreshments served in the Barnard (EPS) second floor atrium at 3:45 \****