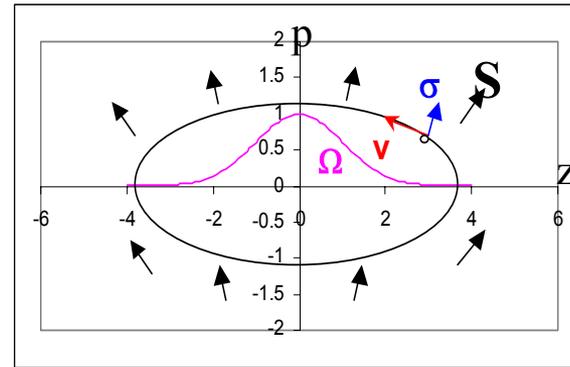


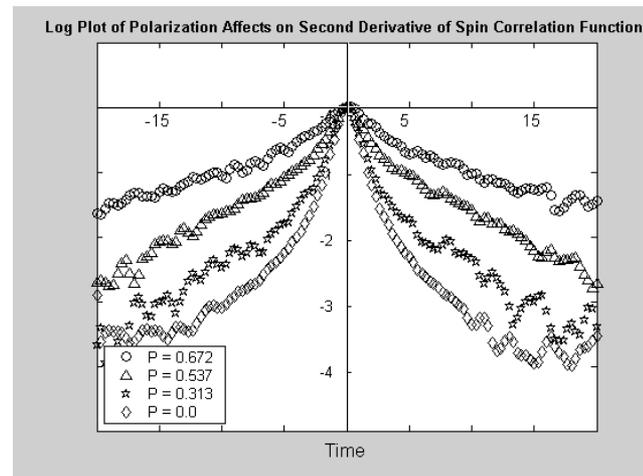
# RUI: Computational Studies of Spin Transport in Quantum Fluids and Solids

Robert Ragan, Univ. Wisconsin - La Crosse, DMR-0071706

At temperatures near absolute zero, the quantum mechanics of collections of identical particles holds many surprises. Spin transport is an important probe into the dynamics of these systems. Our recent research is focused on damping in the pseudo-spin dynamics of hyperfine levels of trapped alkali gases. Thus far we have found anisotropic spin diffusion and Landau damping in nondegenerate gases, and we plan to extend our analysis to degenerate Fermi systems. We have also recently published results on zero-temperature attenuation in Fermi gases, and spin correlation functions in paramagnetic crystals.



Exchange field (black) experienced by a spin (blue) as it travels through phase space in a trapped ultracold vapor. Certain trajectories exhibit Landau damping. *J. Low Temp. Phys.* (in press).



Second derivative of the spin correlation in a paramagnetic crystal, which shows the relaxation time for various polarizations. *J. Low Temp. Phys.* (in press).

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## Education:

Undergraduate Research has been a key component of the revitalization of the UW-L Physics program. In 1992 the program had 5 majors and was scheduled for termination. We are now the biggest physics program in Wisconsin with 130 majors, and 2004 we received the UW Board of Regents Teaching Excellence Award. Undergraduate research attracts students, gets them involved, and enhances their educational experience.

In 2004, 3 undergraduates (Kurt Grunwald, Brian Batell, and Eric Wiita) co-authored peer-reviewed publications with the PI.

## OutReach:

With two undergraduates, the PI conducted a “Amazing Physics” workshop for 30 3<sup>rd</sup> graders. Activities included pin hole cameras, electromagnets, and fun with prisms.



**UW-L Physics, receiving the 2004 UW Board of Regents Teaching Excellence Award. (PI is far right).**