Australian Institute of Physics (SA branch)

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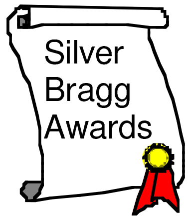
Student Night

at **7:30pm, Tuesday September 10th**
in the **Kerr Grant** lecture theatre,
Physics Building, the University of Adelaide.



Postgraduate students in Physics at South Australian Universities will present their research work to AIP members and students in Physics. The Silver Bragg medals, awarded by the SA branch of the AIP for achievement in 3rd year undergraduate Physics courses at SA universities, will be presented during the meeting. Supper will be provided afterwards by the AIP.

Susan Gunner

School of Chemistry, Physics and Earth Sciences, Flinders University of South Australia

“Comparing quark and gluon dynamics with experiment”

My project involves the extraction of low energy quark-gluon processes from experimental data using the Global Colour Model (GCM) of Quantum Chrono-Dynamics (QCD). The extracted processes include quark and diquark propagators, masses and form-factors and the nucleon form factor, incorporating both the scalar and the axial-vector diquarks.

In the GCM approach the quantization is achieved by the functional integration of weighted averages of the relevant fields. The propagators are initially integrals over quark and gluon fields but through the GCM these are transformed into functional integrals over relevant hadron fields. These transformations are in fact changes of functional integration variables and lead to the Schwinger-Dyson and the Bethe-Salpeter equations for mesons and diquarks, and to Faddeev type equations for the nucleon.

Aidan Brooks

Dept. of Physics and Mathematical Physics, the University of Adelaide

“Wavefront distortion in optical cavities of gravitational wave interferometers.”

In advanced gravitational-wave interferometers the large circulating power required to overcome shot noise and enable high sensitivity, will have the nasty side-effect of reducing the power gain and finesse of the instrument’s optical cavities. Small, but finite, power absorption in the interferometer mirrors changes the curvature and degrades the figure of these mirrors and produces spatial variations in the refractive index of the mirror substrates. These effects increase distortion in the wavefront, thereby reducing the power gain and degrading the wavefront recombination at the beamsplitter, both of which decrease the sensitivity of the interferometer.

We have estimated the extent of the wavefront distortion expected in a typical interferometer. Using these results, we have designed a sensitive off-axis Hartmann-type sensor that can measure the expected spatial variations in the refractive index of an interferometer mirror. A wavefront sensor will also examine the eigenmodes of the optical cavities to reveal changes in mirror curvatures. These sensors will be tested in bench-top experiments that serve as a precursor to sub-scale experiments at the ACIGA Gingin Test Facility. We will describe these sensors and sub-scale experiments, and present results of the bench-top tests.

All students of Physics, especially undergraduate students, are welcome to attend.