Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Black Hole Growth Excites Spin THOMAS POPE, JOHN BLONDIN,
North Carolina State University — An x-ray telescope reveals hundreds of thousands
of x-ray sources invisible to our eyes. These objects are powered by accretion. The
theory of hydrodynamic accretion was first described 70 years ago by Hoyle and
Lyttleton (1939), and has become a fundamental building block for understanding
compact x-ray sources. Modern research on gravitational accretion has focused on
the use of numerical simulations to study the stability of accretion and the possibility
of accretion of angular momentum, which does not exist in the steady-state theory
of Hoyle and Lyttleton. After 20 years there is still no consensus on the stability of
such. We have addressed this confusion by using high-fidelity numerical simulations
run on the NSF’s ‘Ranger’ supercomputer. By starting from an initially steady-state
axisymmetric solution we are now able to show that Hoyle-Lyttleton accretion is
unstable to small perturbations. We use these simulations to quantify the growth
rate and oscillation period of the unstable accretion shock. Provided the star is
sufficiently small, the secular evolution is described by sudden jumps between states
with counter rotating semi-Keplerian accretion disks feeding the star with a specific
angular momentum comparable to a Keplerian orbit at the surface of the star.

Thomas Pope
North Carolina State University

Date submitted: 20 Nov 2009