

# **Dynamics of Planets Orbiting in the Alpha Centauri AB Stellar System**

Jack J. Lissauer  
NASA Ames Research Center  
jack.lissauer@nasa.gov

## **Abstract**

The Alpha Centauri system contains the Solar System's closest stellar neighbors. If an earthlike planet is present in the system, it could in principle be detected using a small space-based telescope. As Alpha Centauri is billions of years old, planets are only expected to be found in regions where their orbits are long-lived. We evaluate the extent of the regions within the Alpha Centauri AB system where small planets are able to orbit for billion-year timescales, as well as how closely-spaced planetary orbits can be within those regions in which individual planets can survive. Individual planets on nearly circular, coplanar orbits can survive throughout the habitable zones of both stars. However, perturbations from the companion star imply that the spacing of such planets in multi-planet systems must be significantly larger than the spacing of similar systems orbiting single stars in order to be long-lived. Because the binary companion induces a forced eccentricity upon the orbits of planets in orbit around either star, appropriately-phased circumstellar orbits with small initial eccentricities are stable to slightly larger initial semi major axes than are initially circular orbits. Small initial eccentricities have a much larger affect on how closely planetary orbits can be spaced. Our results are of special interest as they can guide observers designing instrumentation and search strategies to attempt to discover planets orbiting the nearest sun like stars. Remains significantly higher than for planets orbiting single stars.