# Evolution of Asteroid Binaries under the BYORP effect

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In recent years there has been an effort to understand the process of creating binary asteroids & contact binaries. Our research specifically focuses on understanding the evolutionary mechanisms for synchronous binaries, including conditions under which they may evolve into a contact binary state. The model of this system includes 3rd body perturbations, J2, & BYORP. If the secondary is asymmetrical in shape & the body's rotation is synchronous with its orbit, the secondary will experience the BYORP effect. BYORP can cause secular motion such as the semi-major axis of the secondary expanding or contracting. For this work, we will assume that BYORP causes the binary to expand & the secondary will begin near the primary at the equator. As the system expands the influence of the sun can either cause an evection resonance or the system can follow the Laplace plane. Depending on the obliquity of the primary, the secondary will have different outcomes. If the primary has an obliquity of 75° or below, the secondary will go through the evection resonance. The evection resonance occurs when the longitude of periapsis on the secondary's orbit is equal to the mean motion of the Sun. This resonance causes a secular increase in eccentricity. If the primary has an obliquity above 105°, the secondary will not experience the evection resonance. However between 75° & 105° the secondary may be captured in the evection resonance, the Laplace plane instability or pass through both regions. The Laplace plane is a plane normal to the axis about which the pole of a satellite's orbit precesses, causing a near constant inclination for such an orbit. The Laplace plane has an instability region where the eccentricity of the orbit can increase greatly. Our research will help understand & characterize when the evection resonance or Laplace plane will dominate evolution depending on the obliquity of the primary & the eccentricity of the binary's orbit.