FDRG Seminar

The fluid-structure interactions of a cylindrical waveguide with applications to the spinal disease post-traumatic syringomyelia

presented by

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Syringomyelia is a disease in which fluid-filled cavities, called syrinxes, form in the spinal cord. Syrinx expansion over many years compresses the surrounding neural tissue and blood vessels, which is associated with neurological damage. Here we pursue a deeper investigation of the wave-propagation characteristics of the spinal system in healthy and diseased configurations to serve as a reference for more anatomically-detailed models. We use the standard biomechanical analogue of cylindrical, axisymmetric solid and fluid layers. The spinal cord is represented as an elastic cylinder, which becomes an annulus containing inviscid fluid when a syrinx is included, and this is surrounded by inviscid fluid representing the cerebrospinal fluid (CSF) occupying the subarachnoid space, bounded by a rigid dura mater. Axisymmetric harmonic motion of the cylindrical layers is described by a system of Helmholtz equations that is solved as an eigenvalue problem. We present the dispersion diagram that governs the wave mechanics of the cylindrical waveguide. From the eigenvectors we identify which modes contribute to fluid sloshing and those that contribute to normal-stress concentrations in the elastic solid cylinder. We apply this analysis to a simulated CSF blockage and subsequent syrinx formation in post-traumatic syringomyelia and discuss the implications for the disease progression.

Date: Friday 29th January
Time: 3.30pm – 4.30pm
Location: 215:302
Curtin University, Bentley Campus

No RSVP required. For queries please email:
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