

10.1: Prelude to Static Equilibrium and Elasticity

In earlier chapters, you learned about forces and Newton's laws for translational motion. You then studied torques and the rotational motion of a body about a fixed axis of rotation. You also learned that static equilibrium means no motion at all and that dynamic equilibrium means motion without acceleration.



Figure 10.1.1: Two stilt walkers in standing position. All forces acting on each stilt walker balance out; neither changes its translational motion. In addition, all torques acting on each person balance out, and thus neither of them changes its rotational motion. The result is static equilibrium. (credit: modification of work by Stuart Redler)

In this chapter, we combine the conditions for static translational equilibrium and static rotational equilibrium to describe situations typical for any kind of construction. What type of cable will support a suspension bridge? What type of foundation will support an office building? Will this prosthetic arm function correctly? These are examples of questions that contemporary engineers must be able to answer.

The elastic properties of materials are especially important in engineering applications, including bioengineering. For example, materials that can stretch or compress and then return to their original form or position make good shock absorbers. In this chapter, you will learn about some applications that combine equilibrium with elasticity to construct real structures that last.

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