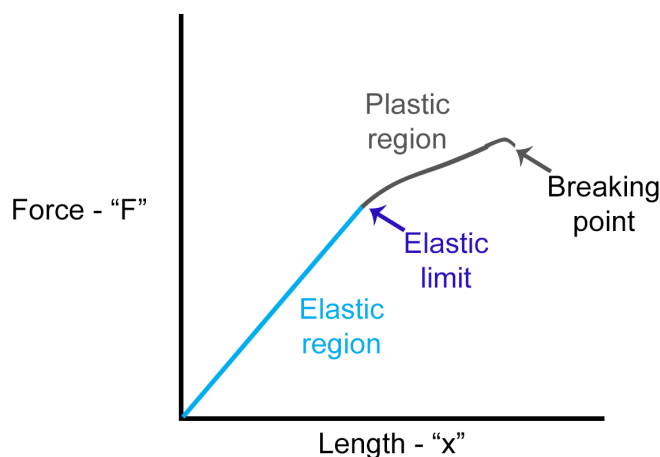


This graph shows the relationship of the elastic and plastic zones, that the more force that is applied to an elastic solid, the more the solid “deforms,” or changes shape. The force may be a “pulling apart force” (extension), a “pushing together” force (compression), or a “twisting” force (torque or torsion). There is a range of applied force through which the solid will resume its normal shape when the force is removed—the elastic zone. Once the force exceeds the elastic limit, the solid moves into the plastic zone and will remain permanently deformed. As more force is applied, the solid moves through the plastic zone. Once it reaches the **breaking point**, the solid breaks.



2.8 PHYSICS AND MATHEMATICAL EQUATIONS

Here we see one of the hallmarks of physics emerge—the ability to describe physical observations with a mathematical formula. In just the last couple of sections of this chapter, we learned that the equation for density is $\rho = \text{mass}/\text{volume}$, as well as Hooke’s law, summarizing a body of matter’s ability to withstand force while in the elastic zone, $F \sim kx$, which holds true for all elastic solids. Finally, we learned about the constant, another hallmark of physics equations, which is a number that allows us to generalize the equation for all applications that involve situations that are specific. For example, the constant k , in the $F = kx$ equation, allows us to apply the equation to all solids when we take the elastic properties of the individual solid into consideration (which is what k is).

2.9 PEOPLE OF SCIENCE

Robert Boyle (1627–1691) Robert Boyle was born in Ireland, the 14th of 15 children, to the Earl of Cork and was raised in a manner typical of the wealthy folk of the time. He received extensive education, learning multiple languages, as well as math and sciences, in his childhood years and then was off to the European continent for further education. He returned to Ireland when he was 17 and promptly began a scientific career that would last up until his death at age 64. He would become known as the father of modern chemistry for his work in advancing the scientific method, the dismantling of the Aristotelian system of 4 elements, and his pioneering work in the behavior of gases and combustion. In addition to this, he was an ardent Christian, personally paying for the Bible to be translated into different languages as he believed it was critical that



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