Breaking Point

Testing Tensile Strength
STRONGER Research Questions

• How can we make materials stronger?
• How can stronger materials be lighter, cheaper, or better in other ways?
• How can we develop new strong materials for specific applications?

[STRONGER demo clip]
Objectives

Participants will learn:

• materials properties depend on structure

• materials can be strong in different ways; for example, some possess high tensile strength while others are more elastic

• that materials scientists test the strength of materials by stressing them to their breaking point
Demo Description

• Test and compare the tensile strength and elasticity of Kevlar®, Nylon, and cotton thread by lifting weighted buckets with wooden dowels
• Then compare the tensile strength of Kevlar® to steel wire

**tensile strength** = amount of stress a material can withstand while being pulled in opposite directions

**elasticity** = ability for material to bend/stretch/rebound
Key Points

• Materials scientists have invented synthetic polymers, such as Kevlar® and Nylon, that are stronger than natural polymers (i.e. cotton)

• The strength of a material is determined by its molecular structure; structure/property
What is a polymer?

**polymer** – large molecule made of repeating structural units

**natural polymers** – wood, rubber, cotton, wool, leather, silk; proteins, enzymes, starches, cellulose

**synthetic polymers** – plastics, rubbers, fiber materials
Applications of Kevlar®