Mechanical engineers and materials scientists will address the most pressing challenges of the 21st century: providing a plentiful supply of clean energy; ensuring high-quality, affordable health care; and maintaining the security of nations and communities. The principles of mechanics are embedded in each of these challenges, determining the behavior of man-made and natural systems as diverse as wind turbines, crawling cells and fighter jets. New materials — nanostructured, multifunctional, energy-harvesting, light, strong and environmentally friendly — will disrupt the way these systems are designed and made.
Researchers shed light on how cilia work

A team of researchers at WashU wanted to determine how length affected the mechanical efficiency of beating cilia. They found that most mechanical metrics, including force, torque and power, increased in proportion to the length of the cilia, but there was a “sweet spot” in terms of efficiency. The findings give insight into cilia in humans and how defects lead to disease.

Improving semi conductors for solar cells, LEDs

McKelvey Engineers have new information to find alternatives for lead in solar cells, which not only are toxic, but also are unstable in light, moisture and heat and break down in a matter of days, leaking lead into groundwater. Rohan Mishra is studying whether a nontoxic element — bismuth, lead’s neighbor on the periodic table — is a safer and equally efficient substitute for lead in perovskites.

Using bacteria to create a water filter that kills bacteria

Professors Srikanth Singamaneni and Young-Shin Jun and their teams blended their expertise to develop an ultrafiltration membrane using graphene oxide and bacterial nano-cellulose that they found to be highly efficient, long-lasting and environmentally friendly. If their technique were to be scaled up to a large size, it could benefit developing countries where clean water is scarce.

Aortic wall dysfunction studied

With a three-year, $300,000 Transformational Project Award from the American Heart Association, Jessica Wagenseil, associate professor, will study how change in the structure of the artery’s wall may contribute to the progression of an aneurysm. Wagenseil studies the function of the protein elastin, which gives arteries their elastic properties.