Enzymes

Ever pondered where the word *enzyme* comes from? It's based on two words, *en* and *zyme*. *En* is easy ("in"), but *zyme*? You'd have to either be a language buff or a Greek speaker to recognize *zyme* as "yeast." Even though *enzyme*'s origins are Greek, it was a German doctor who proposed the term in the 1870s while isolating the protein trypsin. He chose it to describe compounds that assisted in fermentation, using the Greek for "in yeast," not knowing that enzymes appear in almost all living things.

Enzymes are used all over the place in biological systems, working as catalysts that change other compounds. From a chemistry perspective, enzymes can do one of two things. They either provide an *alternative reaction pathway*—taking a different, easier route to get to the same outcome—or they trigger an entirely different reaction. Enzymes are amazingly selective. They'll fit very, very few molecular structures, allowing for a biological precision envied by drug makers. (Some drug compounds, like protease inhibitors, are based on inhibiting enzymes!)

While many enzymes are naturally present in food, we sometimes add foreign enzymes to change flavors and textures when cooking. Cheese was traditionally made by exposing milk to parts of a ruminant animal's stomach, which has a group of enzymes, called *rennet*, that normally aid in digestion but also cause coagulation (leading to cheese formation). A simpler example is the breakdown of sucrose. Imagine a sucrose molecule, which is one glucose molecule and one fructose molecule, bound together by a common oxygen atom. When heated in the presence of water, the molecule vibrates with more and more kinetic energy, and eventually a water molecule manages to slip in where that oxygen atom is linking them, breaking the sucrose molecule into one glucose and one fructose molecule. (The water takes the place of the oxygen atom in one of them, making this a hydrolysis reaction.)

There's an enzyme, invertase (enzyme names often end in "ase"), that provides an alternative pathway for this reaction. Invertase wraps around part of the sucrose molecule, gripping it in such a way that a water molecule can more easily slip into where the oxygen atom is holding the two simple sugars together. Once that water molecule slips in, the sucrose breaks down; the invertase enzyme can no longer hold on to the two parts and drifts away. Less energy is required for the reaction, and it's very selective—other compounds in the system won't have to be exposed to as much heat to cause the reaction. Enzymes are powerful!