Press Release

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**Researchers Build a Synthetic Enzyme in an Effort to Improve Human’s Lives**

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Enzymes are nature’s catalysts, capable of speeding up reactions to occur billions of times faster than they would normally—called their background rate. Humans require these reactions for building things or to carry out chemical reactions including creating tissue, breaking down food, or growing hair. Currently, naturally occurring enzymes are the fastest catalysts available for speeding up reactions. However, in a cross-department effort, researchers at the University of Washington are the first group ever to design human-made or synthetic enzymes, a breakthrough that has applications for improving human’s lives. The research is explained in the latest issue of *Science* magazine.

Historically, designing enzymes from scratch has been a difficult task for scientists. Enzymes work in a lock-and-key fashion and are built of amino acids in a complex three dimensional structure—making them difficult to understand. However, using the power of the computer and human intellect, researchers at the University of Washington’s chemistry department are beginning to unlock the mysteries of enzymes and open the door to a host of applications for improving people’s lives.

The researchers focused on speeding up the Diels-Alder reaction—first discovered in 1928. The reaction was appealing to the UW researchers because no naturally occurring enzymes catalyze this reaction, so there would be no question that any discovered catalyzed reaction would be man-made. Naturally occurring enzymes catalyze extremely fast, and the researchers intended to make a catalyst that would speed up the Diels-Alder reaction to the rate of naturally occurring enzymes.

The first step in solving the puzzle was to apply the power of computers. As Forrest E. Michael, part of the Department of Chemistry explained, the research used the Rosetta computer program. Rosetta was designed by David Baker of the Department of Biochemistry, and the program allowed the researchers to narrow down 1019 or billions of possible reactions down to 87 possible reactions for catalyzing. In the end, the team was able to find two reactions that were somewhat successful.

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As Michael pointed out, the two catalysts his team created were “good, but not great.” He described the reaction as speeding up reactions millions of times faster compared to the background rate instead of billions of billions times faster compared to the background rate of naturally occurring enzymes. However, it is a big first step in unraveling the mysteries of enzymes—microscopic entities necessary for human life.

With improvements upon this research, the scientists envision applying their discoveries towards three main applications. One application for synthetic enzymes includes pharmaceutical research because the industry relies on constantly building molecules, a process that the synthetic enzyme catalyzing can speed up. Also, eliminating toxicity from water is a possible application since enzymes are very effective at sniffing out pollutants in low concentrations. Pollutants in water, even at low concentrations, can be harmful to humans. Lastly, further research may allow chemists in the future to tweak naturally occurring enzymes and make their reaction rates even faster.

As Michael concedes, the breakthrough of creating the first synthetic enzyme is only the first step towards figuring out how the enzyme works. However, with more time and research, the scientists are looking forward to more breakthroughs and discoveries in an effort to improve human life.

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