

Chemistry Nobel Prize awarded for harnessing evolution to help humans



The Nobel Prize for chemistry goes to Frances Arnold, George Smith, and Gregory Winter
Niklas Elmehed

By Sam Wong

The [Nobel Prize](#) in chemistry has been awarded to three scientists who have harnessed the power of evolution to develop biological molecules with useful applications.

Frances Arnold, based at the California Institute of Technology in the US, developed a way to direct the evolution of enzymes to make them much more effective at catalysing chemical reactions. Her work has found applications in [brain imaging](#), [biofuels](#), [pharmaceuticals](#) and the chemical industry. She has been awarded half of the prize money, and is the fifth woman to win a chemistry Nobel.

The other half is split between George Smith at the University of Missouri and Gregory Winter at the MRC Laboratory of Molecular Biology, UK. This pair developed ways to develop therapeutic antibodies, which are now used to treat [autoimmune diseases](#), anthrax and cancer.

“This has formed the basis for a pharmaceutical revolution,” said Nobel committee member Sara Snogerup Linse while announcing the prize.

Read more: <https://liliec.be/resume/Curious Hugo/Evolution machine: Genetic engineering on fast forward.pdf>

All three have applied the principles of [Darwin](#) in test tubes, said committee chair Claes Gustafsson. Their work is an extension of selective breeding, which has been practised by humans for millennia.

Enzymes are proteins made in cells which catalyse chemical reactions, making them work much faster. They have evolved over millions of years, but in 1993, Arnold worked out that you could direct their evolution and make the process happen much faster.

She started by taking the gene that codes for an enzyme, then randomly introducing mutations, creating new variants of the enzyme. Then she screened the resulting variants and selected the ones that were most effective at catalysing the reaction she wanted. The selected variants then went through another round of mutation and selection, and the process was repeated. After three generations, she had an enzyme that was 256 times more efficient than the starting enzyme.

Read more: [Donna Strickland is the third woman ever to win a physics Nobel Prize](#)

Smith developed a way to use viruses that infect bacteria, called phages, to evolve new proteins. Winter used this technique to direct the evolution of antibodies – molecules produced by the immune system to recognise and attack pathogens. Their methods have been used to develop many new pharmaceuticals, starting with adalimumab, a treatment for rheumatoid arthritis, psoriasis and inflammatory bowel diseases, which was approved for medical use in 2002.

