

# Meet...

## Virginia Cornish

CHEMICAL BIOLOGIST, *New York City*

### What She's Doing

**A vast chemical diversity exists within Earth's land and seas. This enables nature to rapidly evolve new molecules, enzymes with new functions, and even complex systems.**

Virginia Cornish wants to do it herself. She wants to redesign biological systems to enhance chemical diversity. She is using genetic engineering methods to mix and match natural substances in new ways.

Manipulating biological systems has practical value, Cornish says, but it also helps deepen understanding of how life works at its most fundamental level. Directed, or lab-based, evolution allows Cornish to use the power of natural selection to evolve molecules with desirable properties not found in nature.

The key steps include first tinkering with genes, changing them slightly to create a large collection of possible ingredients. Then, Cornish amplifies those that have desired properties, or new functions, so she can pick out the best ones and study them in more detail.

**"Chemistry is my favorite science because it is rooted in creativity—inventing new molecules with unanticipated functions."**

### Her Findings

Cornish says that while scientists have used directed evolution to select RNA and proteins with special properties, no one has been able to do the same for enzyme-catalyzed reactions. So she designed a new method to do just that.

Here's how it works: Cornish creates a three-way molecular "logic gate." Sort of like a computer program, the system rapidly runs through many possible combinations of catalysts that attach to a protein. If catalysis is quick and efficient—that particular protein activates a gene, creating a detectable change. Sort of like a domino effect. Recently, Cornish used this technique to identify a new catalyst for breaking down cellulose. This finding overcomes a major bottleneck in converting biomass to ethanol.

Meet more interesting chemists at <http://www.nigms.nih.gov/ChemHealthWeb>.



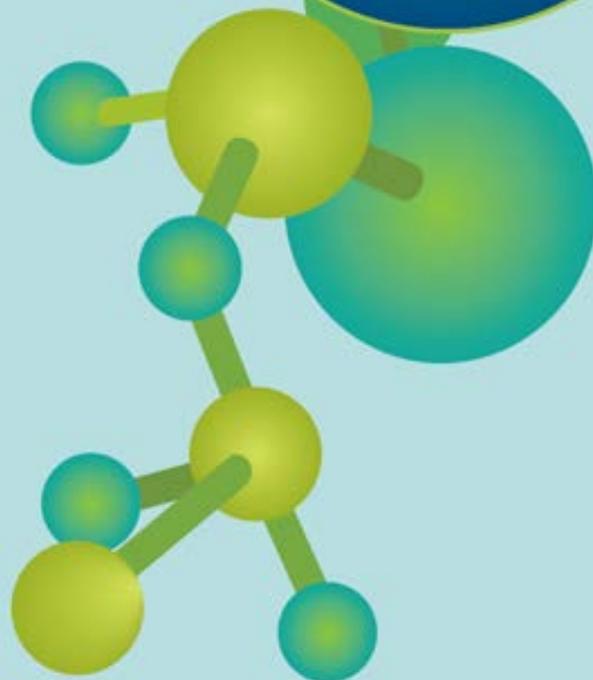
**BORN IN**  
Savannah, Georgia

**JOB SITE**  
Columbia University

**FAVORITE KIND OF MUSIC**  
College music stations that play everything

**BEST THING TO DO ON A SNOW DAY**  
Go sledding with my young kids

**FAVORITE SUBJECTS IN HIGH SCHOOL**  
Chemistry and poetry



National Institute of  
General Medical Sciences