

# “Antibiotic Discovery by Means of Computers”

Virtual Seminar  
Wednesday  
October 28, 2020  
3:00 pm



**Cesar de la Fuente**  
Presidential Assistant Professor  
Microbiology, Bioengineering and Psychiatry  
University of Pennsylvania

## Abstract

Until now, the natural world has supplied us with antibiotics. Bacteria, however, are increasingly resistant to these drugs. The next generation of antibiotics will likely come not from nature but from computer-based discovery. Computer-driven approaches have the potential to outperform humans, as demonstrated for pattern recognition of images and text. In order for machines to discover novel drugs and optimize antimicrobial properties, they have to be able to understand, read and write molecules. In this talk, I will describe our efforts in developing computational approaches for antibiotic discovery. I will discuss how we trained a computer to execute a fitness function following Darwin’s algorithm of evolution to select for structures that interact with bacterial membranes, yielding the first artificial antimicrobials that kill bacteria both *in vitro* and in animal models. My lab has also developed pattern recognition algorithms to mine the human proteome, identifying throughout the body thousands of antibiotics encoded in proteins with unrelated biological function. Computer-made drugs may help to replenish our arsenal of effective drugs.

## Bio

César de la Fuente, Ph.D. is a Presidential Assistant Professor at the University of Pennsylvania, where he is leading the Machine Biology Group to integrate synthetic biology, microbiology, and AI. Prof. de la Fuente seeks to expand nature’s repertoire to build novel synthetic molecular tools and devise therapies that nature has not previously discovered. The Machine Biology Group aims to develop computer-made tools and medicines that will replenish our current antibiotic arsenal, engineer the microbiome and provide novel approaches to study and control brain function and behavior. De la Fuente is an NIH MIRA investigator, a BBRF Young Investigator, and has received recognition and research funding from numerous other groups. Prof. de la Fuente was recognized by *MIT Technology Review* in 2019 as one of the world’s top innovators for “digitizing evolution to make better antibiotics.” He was selected as the inaugural recipient of the Langer Prize (2019), an ACS 2020 Kavli Emerging Leader in Chemistry (2020), AIChE’s 35 Under 35 Award (2020), and received the ACS Infectious Diseases Young Investigator Award (2020). In addition, he was named a Boston Latino 30 Under 30, a 2018 Wunderkind by *STAT News*, a Top 10 Under 40 of 2019 by *GEN*, a Top 10 *MIT Technology Review* Innovator Under 35 (Spain), 30 Rising Leaders in the Life Sciences by *In Vivo Magazine*, and received the 2019 Society of Hispanic Professional Engineers Young Investigator Award. His scientific discoveries have yielded over 75 peer-reviewed publications and multiple patents.

Fall 2020 CBE Seminar Series

