

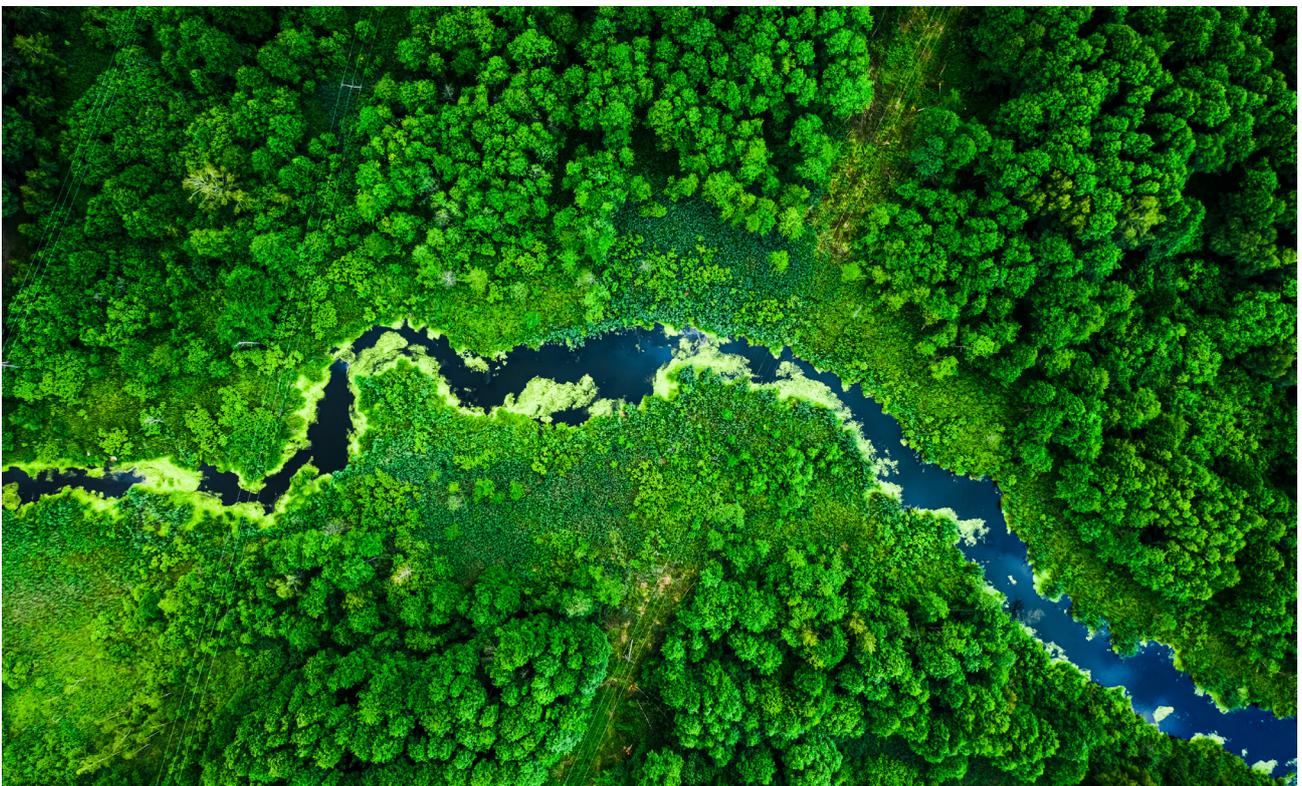
# NBD

Rethink &  
Accelerate

NOSTRUM BIODISCOVERY

## ENZYME ENGINEERING:

Building a green and more efficient industry through computing



# ENZYME ENGINEERING



## Consumer Goods

Consumer Goods companies are using enzymes in their production processes and as part of the final products (detergents, foods & beverages, cosmetics & hygiene products). Moreover, enzymes are widely used as part of the production chain since they are more environmentally friendly and efficient. Finding and evolving enzymes with enhanced properties is key to improve products and productivity in industry.



## Waste Management

Unfortunately, most of the industrial waste is dumped into the residual water that must be treated in wastewater plants. Furthermore, pig slurry treatment limits the meat industry growth. Finally, accumulation of non-degradable plastics, low paper reutilization efficiency and lignocellulosic biomass deposition represents a huge headache for governments. Enzymes can be designed to degrade these widespread contaminants into non-toxic waste, or even to valuable components. This will contribute to the circular economy representing the only sustainable long-term solution.



## Biomass

Biomass for Biofuels, Fertilizers, Livestock or Paper is undergoing a revolution. Enzyme Engineering is improving production systems and making some of them already profitable without government grants. The Lignocellulosic market is experiencing a huge demand increase due to the developments in terms of machinery and enzymes' performance. Nevertheless, there is still room for increasing the percentage of profits in regards to costs.

Apart of these sectors, our Enzyme Engineering services are adaptable to all industrial sectors demanding it. Biotechnology companies and the textile industry are other sectors where NBD's expertise has been proved.



# WHAT WE DO / WHAT WE SOLVE

Nostrum Biodiscovery can create an enhanced enzyme tailored to your particular needs through its proprietary *in silico* enzyme evolution methodology and through molecular modeling on mutated enzymes candidates.

PELE efficiently maps the interactions between an enzyme and its substrate highlighting key residues.

*In silico* Enzyme Directed Evolution allows us to quickly test tens of thousands of mutant variants in short time, reproducing (and expanding) months of work in an experimental lab for just a few hours of computational time. The combination of PELE with powerful computational resources leads to a massive space screening.



## PluriZyme

One enzyme, one active site. NBD breaks the dogma. Through our computational approach, we can introduce artificial fully functional active sites, crafting PluriZymes, a breakthrough in Biotechnology.



## Computational Bioprospecting

Using our methodology, we can select the best enzymes from large databases. Computational Bioprospecting will save weeks of experiments using a combination of different computational tools.



# EXAMPLES OF SUCCESS WITH CUSTOMERS & PUBLICATIONS

## Enzyme Engineering

*Computer-aided laccase engineering: toward biological oxidation of arylamines*

<https://pubs.acs.org/doi/abs/10.1021/acscatal.6b01460>

*Rational enzyme engineering through biophysical and biochemical modeling*

<https://pubs.acs.org/doi/abs/10.1021/acscatal.6b00028>

*Increasing redox potential, redox mediator activity, and stability in a fungal laccase by computer-guided mutagenesis and directed evolution*

<https://pubs.acs.org/doi/abs/10.1021/acscatal.9b00531>

## PluriZymes

*Rational engineering of multiple active sites in an ester hydrolase*

<https://pubs.acs.org/doi/abs/10.1021/acs.biochem.8b00274>

*Genetically engineered proteins with two active sites for enhanced biocatalysis and synergistic chemo- and biocatalysis*

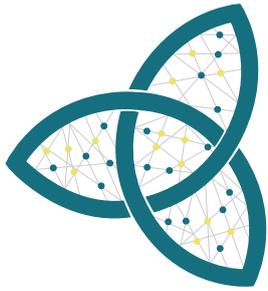
<https://www.nature.com/articles/s41929-019-0394-4>

# CO-DEVELOPMENTS



- NBC-01
- NBC-02
- NBC-03

USE	<i>IN SILICO</i> EVOLUTION	Experimental validation	Industrial set up	LICENSING
BIOETHANOL PRODUCTION				
LIGNIN DEGRADATION				
UNDISCLOSED				



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