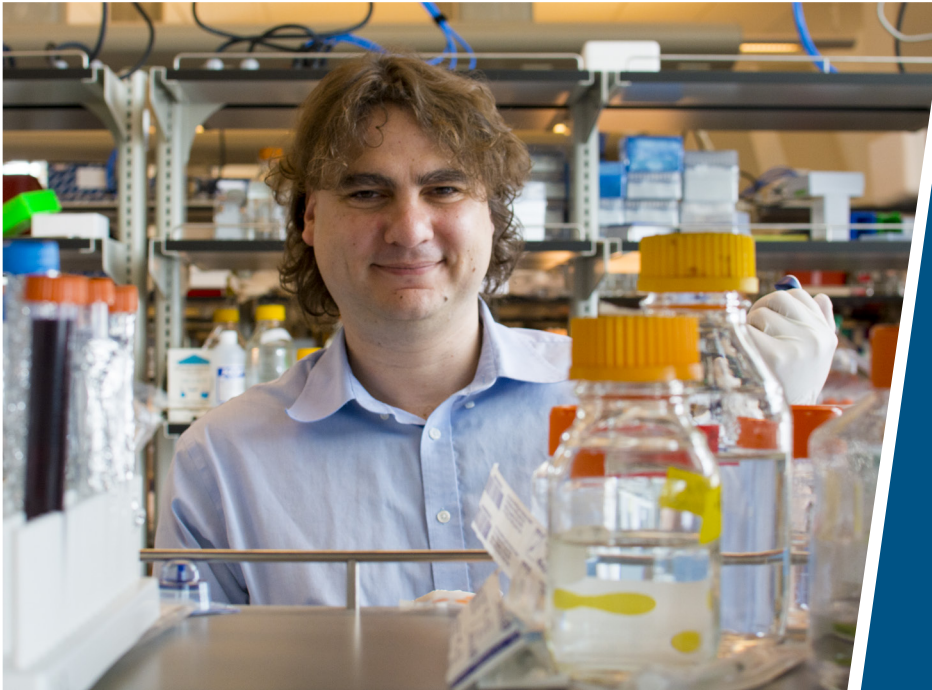


Stavros Lomvardas, PhD

By Studying Smell, Understanding the Brain

COLLEEN DENG



Stavros Lomvardas, PhD, is a professor of biochemistry and molecular biophysics at Columbia University and a principal investigator at the Mortimer B. Zuckerman Mind Brain Behavior Institute. He received his undergraduate degree in molecular biology from the University of Crete and his PhD in biochemistry from Columbia University. After completing his postdoctoral training with Dr. Richard Axel at Columbia, Dr. Lomvardas joined the Department of Anatomy faculty at the University of California, San Francisco, in 2006. He returned to Columbia to join the Zuckerman Institute in 2014.

At the Zuckerman Institute, Stavros Lomvardas, PhD, is exploring how people make sense of the millions of scents they encounter every day.

Why do people fear the smell of a brush fire but embrace the scent of summer rain? Why do we find the aroma of coffee invigorating, and rotten eggs, foul? Our ability to interpret an almost infinite number of smells relies on our olfactory receptor genes, genes that encode the molecules that detect odor, which were first identified by Dr. Richard Axel, a professor at Columbia and a codirector at Columbia's Mortimer B. Zuckerman Mind Brain Behavior Institute.

Strikingly, although most people have hundreds of these odor-decoding genes, only one of these genes is "turned on" in each olfactory neuron, a type of cell that identifies smell and transmits information to the brain. Thus, each neuron is limited to detecting only a few odors, and it is the quantity and diversity of these neurons that give people the ability to smell everything from stinky cheese to fragrant flowers.

Despite this basic understanding of how our sense of smell works, much less is known about it on a molecular level, a puzzle Dr. Stavros Lomvardas has been grappling with since his postdoctoral studies in Dr. Axel's lab at Columbia.

"How can it be that there are 1,000 olfactory receptor genes in any given neuron, but only one gets expressed?" says Dr. Lomvardas, who joined the Zuckerman Institute as a principal investigator in 2014. "This, to me, is incredible."

The implications of Dr. Lomvardas's research go far beyond whether you enjoy your pot roast dinner or pinch your nose when taking out the trash.

“When we understand how diversity works with olfactory receptor neurons, it affects not just our understanding of the senses, but how it shapes human behavior and development as a whole,” he says.

After all, for most of the mammalian world, scent is critical, determining whether animals can find food, identify potential mates, and escape from predators. A properly functioning sense of smell can literally save lives, since it is our alarm system for fires, gas leaks, and other threatening events. In fact, people without the ability to smell (a condition known as anosmia) are three times more likely to die prematurely than those with healthy noses, according to a recent study by scientists at the University of Chicago.

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Smell — or the absence thereof — may also offer a clue to an entirely different area of neuroscience research: in neurodegenerative disorders such as Alzheimer's, anosmia is one of the earliest indicators of disease. This has led Dr. Lomvardas to consider a provocative question: Could the origins of neurodegenerative diseases be connected to defects in our olfactory system? “It would explain the puzzling observation that the first clinical manifestation and most accurate prediction for the future onset of Alzheimer's and various forms of dementia is the loss of ability to smell,” he notes. Dr. Lomvardas hopes to pursue this research further in the future.

Such investigations are a long way from Dr. Lomvardas's roots back in Greece, where his brother, father, and grandfather are all dentists. The family assumed Dr. Lomvardas would become one, too, despite his lifelong passion for science. It wasn't until he won the 2014 Vilcek Prize for Creative Promise in Biomedical Science — granted to “foreign-born scientists who have made outstanding contributions to society in the United States” — that his parents, who made the journey to the US for the occasion, acknowledged that root canals were probably not in their son's future after all. “For me, this research is the most exciting thing,” Dr. Lomvardas says.