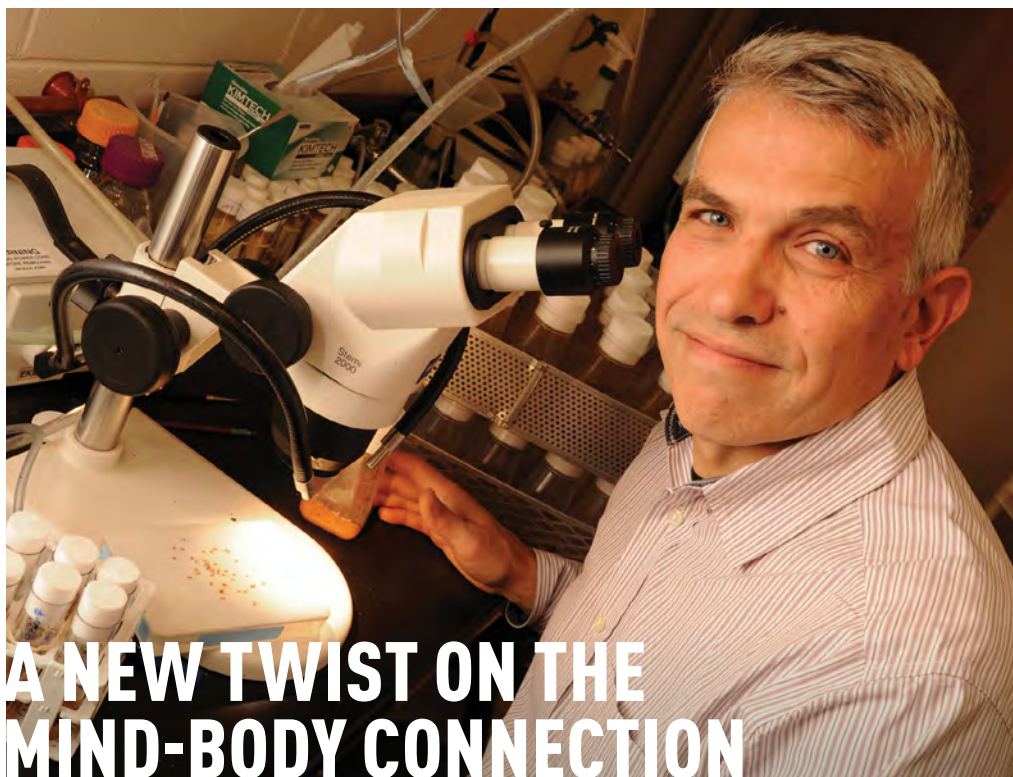


Jon Gilbert Fox



## A NEW TWIST ON THE MIND-BODY CONNECTION

**I**N OCTOBER, GIOVANNI BOSCO, PHD, an associate professor of genetics at the Geisel School of Medicine, received a prestigious \$3.7 million, five-year Pioneer Award from the National Institutes of Health (NIH). The grant supports exceptional investigators pursuing bold, highly innovative research projects.

Bosco's project began with a highly speculative question: Can the social experiences of parents be inherited by their offspring? It's the classic nature vs. nurture question with a twist—do specific cellular and molecular mechanisms that underlie the mind-body connection make it possible for a cognitive social experience to alter germline cells, which can lead to inherited behavior?

“One of the most exciting findings of modern molecular genetics has been that the information encoded in our DNA cannot completely explain heritability of complex traits,” Bosco says. “We are rediscovering how a mind-body connection through cognitive experiences can have profound effects on physiology and health—however, the possibility that cognitive experiences, or state-of-mind, can contribute to heritability is relatively unexplored at the level of molecular genetics.”

Bosco and his team are seeking to discover new molecular mechanisms within the nervous system that impart inherited characteristics in offspring, which in turn affect their own social behavior.

“It's virtually impossible to study this ques-

tion in the human population. The time needed to observe patterns of inheritance over multiple generations isn't feasible,” Bosco explains. Moreover, when studying any behavior, it's often impossible to tease apart the influences of society and culture from what we inherit biologically. So what are we left with? The common fruit fly, which reproduces quickly and displays a complex suite of social behaviors that we know have counterparts to human behavior.

Despite the remarkable differences in the social behaviors of flies and humans, these complex processes depend on many of the same genes. And because flies reproduce every 10 days, it is possible for Bosco to observe the behavior of many *Drosophila* generations in a relatively short period of time while precisely controlling their environment.

“A lot of times really phenomenal innovation comes out of things that are elegantly simple—and Gio's whole assay system, which has to do with these tiny insects, is something that appears to be very simplistic, yet it has relevance to behaviors in our own world that are incredibly complex,” says Leslie Henderson, PhD, a professor of physiology and neurobiol-

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ogy at Geisel, who has collaborated with Bosco. “In particular, how biological systems may regulate social behaviors across generations.”

Because of its speculative nature, Bosco acknowledges this is a high-risk project with no guarantees of specific outcomes. But as a scientist, he says, if trans-generational inheritance of behaviors such as post-traumatic stress related disorders and critical decisions about existential threats exist—and he argues they do—then understanding them at the molecular level can greatly facilitate approaches to break patterns of unhealthy behavior.

“Professor Bosco's receipt of the Pioneer Award is a signal honor and achievement—award winners represent a handful of life scientists selected as the very best among the best in a trans-NIH competition,” says Jay C. Dunlap, PhD, chair and professor of genetics at Geisel. “Gio's work is anchored in his remarkable demonstration of trans-generational genetic “memory” that can predispose social behaviors in the next generation.”

As human beings, we all want to know what makes us who we are. Nearly everyone can reach back into family history and find examples of behaviors in ourselves that are like those of a great-uncle, or grandparent we've never met.

“I think it's important to point out the types of behaviors we are studying are critical to the survival of one generation to the next,” Bosco says. “If behavior can filter down to future generations, we can start thinking differently about how we structure our physical and social environments, and how we provide an optimal environment for our children to develop and succeed.”

SUSAN GREEN