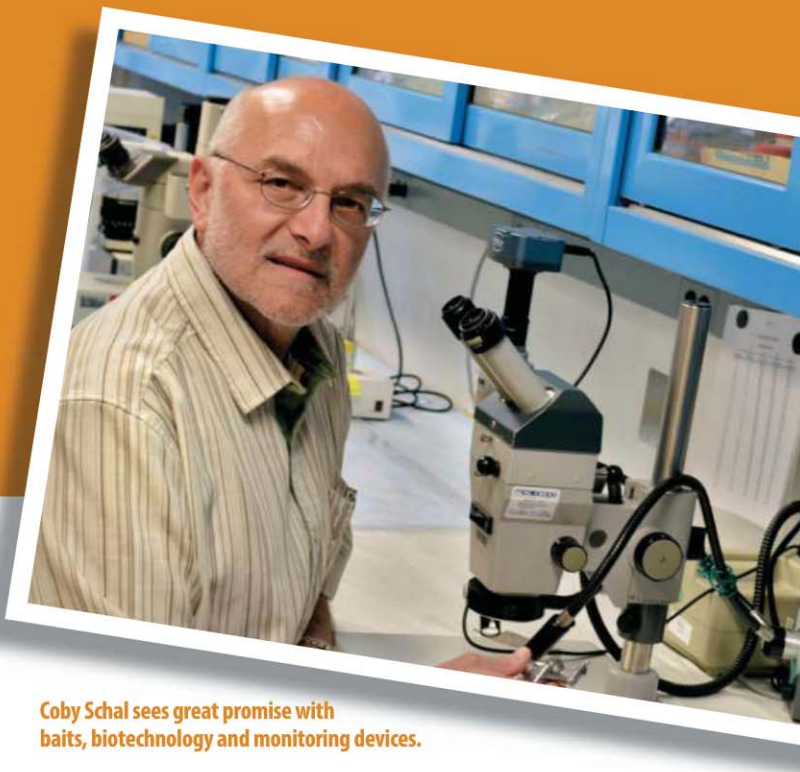


Dr. Coby Schal North Carolina State University



As a child, were you fascinated by or fearful of pests? I grew up in northern Israel, which is rich with various insects. I enjoyed watching them while playing outdoors and on nature walks, but my passion for observing and investigating insects came much later in life. Between my junior and senior years at the State University of New York at Albany, I spent a summer at the Cranberry Lake Experiment Station in the Adirondacks, where I took a field course with Dr. Gerald Lanier and read some of Dr. Tom Eisner's research about insect chemical ecology. I was blown away by the amazing evolution of insects. Eisner's book "For Love of Insects" is a must-read for all entomophiles.

When and where did you first fall for the business? I studied tropical cockroaches for my Ph.D. at the University of Kansas. Almost all of my dissertation research was in the tropical rain forests of Costa Rica. At first I thought I was a tropical ecologist, but when I was offered a faculty position in urban entomology at Rutgers University in 1984, I retooled and redirected my research from tropical insects to household pests. Some of the most extreme insect adaptations to commensal life with humans are in urban entomology.

Which three management technologies do you predict will take off in the next 10 years? Since the mid-1980s, baits have been deployed effectively, and this mode of pesticide delivery will remain highly effective.

A second emerging pest management technology is biotechnology. New molecular biology tools allow us to deliver highly specific genetic sequences that interfere with specific genes whose protein products are required for proper function.

Finally, surveillance and monitoring technologies will be critical.

What are the top obstacles facing the industry? In the past half century, the relationship between academic urban entomologists and pest management professionals has been exemplary; and this relationship spurred significant advances in our understanding of pest biology and efficacious pest control.

I have three interrelated concerns for the future of this relationship:

➤ Budget cuts in academia, and especially in cooperative extension, have eroded this relationship in some states.

Coby Schal sees great promise with baits, biotechnology and monitoring devices.

- Budget and personnel cuts in state agencies might relax certification and recertification requirements, and diminish the level of expertise and proficiency required in pest control.
- Belt-tightening in the pest management industry might de-emphasize continuing education and certification.

It would be ironic if pest management professional training were compromised at the same time the industry's technologies become more sophisticated and technical.

Tell us about your research regarding mosquitoes in Peru as a result of a Bill & Melinda Gates Foundation grant. In collaboration with Drs. Charles Apperson (also at NCSU) and Dawn Wesson (Tulane University), our lab has conducted studies about chemicals that mediate mosquito oviposition behaviors. We have identified several fermentation products from water containers that stimulate females to lay eggs. We also identified several key bacterial species that produce these compounds.

Within the Gates-funded project, we're developing an area-wide management strategy for mosquito vectors based on their biology and behavior. We attract gravid female mosquitoes to oviposition traps baited with bacteria and attractant chemicals. The ovitrap strategy should be highly effective at targeting the fraction of the adult female population that vectors disease.

Our preliminary results in Iquitos, Peru, are promising and suggest area-wide application with this approach could significantly lower dengue transmission.

Does this research have an application in the U.S.? *A. albopictus* (Asian tiger mosquito) has become prevalent in the Eastern half of the U.S. It's a particularly effective vector of disease; it feeds on other mammals and birds, and it's a competent vector for many pathogens including West Nile virus, yellow fever virus, St. Louis encephalitis, dengue fever and

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Chikungunya fever. Our attractants and the oviposition trap we developed also are effective against this mosquito species. We hope to implement similar area-wide approaches in the U.S.

What other research programs are you conducting?

1. The emergence of new pest species, such as the bed bug.
2. The recent availability of new molecular techniques that have revolutionized the way science is conducted.
3. The recent recognition that existing pest management approaches can significantly reduce the burden of cockroach-produced allergens.
4. In a collaborative project with a former researcher in our lab, Dr. Ludek Zurek, we've screened the gastrointestinal microbial community of German cockroaches from swine farms and homes for antibiotic sensitivity in clinically important bacterial species. The results show extensive use of antibiotics as growth promoters in the livestock industry might constitute strong selection pressure for evolution and selection of antibiotic-resistant bacterial strains, and that house flies and German cockroaches play a significant role in the dissemination of antibiotic-resistant bacteria within and between animal production farms and from farms to residential settings.

In collaboration with Dr. Ed Vargo, we've investigated the genetics of bed bugs, addressing where the bugs are coming from, how many typically establish a new infestation, and what the genetic relatedness of

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AT A GLANCE: Dr. Coby Schal

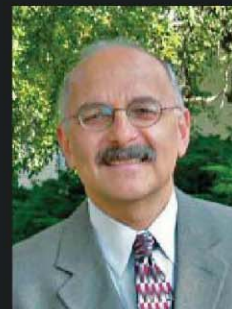
Title: Blanton J. Whitmire
Distinguished Professor of
Structural Pest Management,
North Carolina State University

**Years in pest
management:** 30

Industry mentors: Blanton
J. Whitmire, Drs. Charles Wright and William Bell

Top three industry achievements to date:

- Identified several novel sex pheromones of cockroaches.
- Developed a highly effective approach for eliminating pest cockroaches and significantly reducing cockroach-produced human allergens in collaboration with National Institute of Environmental Health Sciences (NIEHS) scientists.
- Demonstrated insects can be preadapted to certain insecticides before the products are introduced for commercial use, rendering the insecticides less effective.



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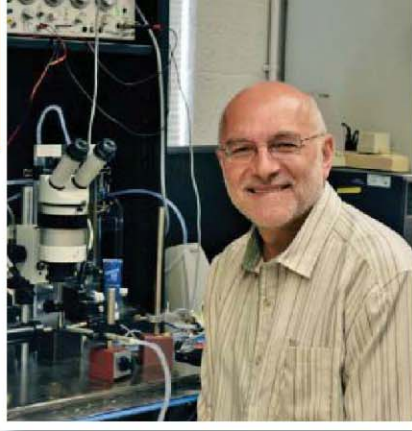
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NCSU's Coby Schal is a research pioneer.

Continued from page 90 various infestations within a building and throughout the U.S. is. We're also investigating the relationship between pesticide resistance and genetic variation throughout the U.S.

In collaboration with Dr. Jules Silverman, we've been characterizing the cellular mechanisms responsible for the emergence of glucose aversion in German cockroach populations. This novel behavioral trait has appeared in multiple locations, and we're seeking to understand whether all cockroach populations share the same mechanism and what caused this dramatic shift in feeding habits.

Website: www.cals.ncsu.edu/entomology/schal_lab/overview

Research PDFs: www.cals.ncsu.edu/entomology/schal_lab/Publications

Bio: www.cals.ncsu.edu/entomology/schal_lab/Schal_PI

College profile (2011): www.cals.ncsu.edu/agcomm/news-center/perspectives/college-profile-coby-schal

Recent profile (2013): www.the-scientist.com/?articles.view/articleNo/34439/title/Tough-Bugger

How does this research apply to the pest management industry?

Bed bugs. Our research about the genetic structure of bed bug infestations within buildings is particularly relevant to the pest management industry. The results reveal infestations within multistory apartment

buildings often start from an introduction of a small group of genetically related individuals, followed by extensive infestation spreading throughout the building. These findings show bed bugs engage in active and human-mediated dispersal, and highlight the importance of early detection and intervention — before infestations spread out of control.

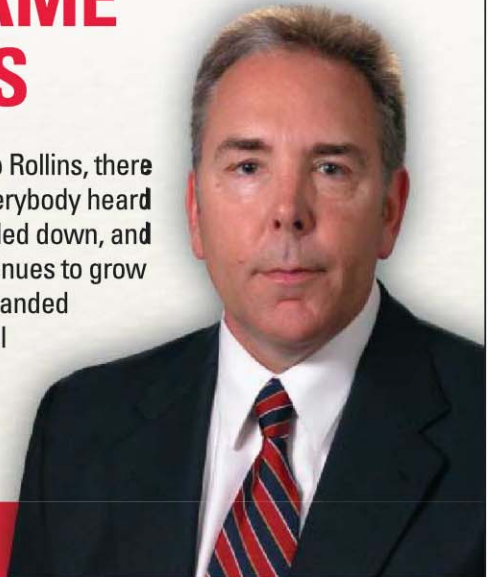
Cockroaches. There are many examples of physiological resistance mechanisms with cockroaches and bed bugs, but no thoroughly understood mechanism for behavioral resistance to insecticide formulations. The research about glucose aversion in cockroaches reveals such a mechanism for the first time and is pivotal for bait development. It's essential we understand what foods the cockroach will accept so formulations scientists can optimize bait performance. **PMP**

Jerry Mix was editor/publisher of PMP until his retirement in 2004. Contact Mix, a member of the PMP Hall of Fame (Class of 2005), at jnmix@aol.com.

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- Tom Walters, President, Western Pest Services



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