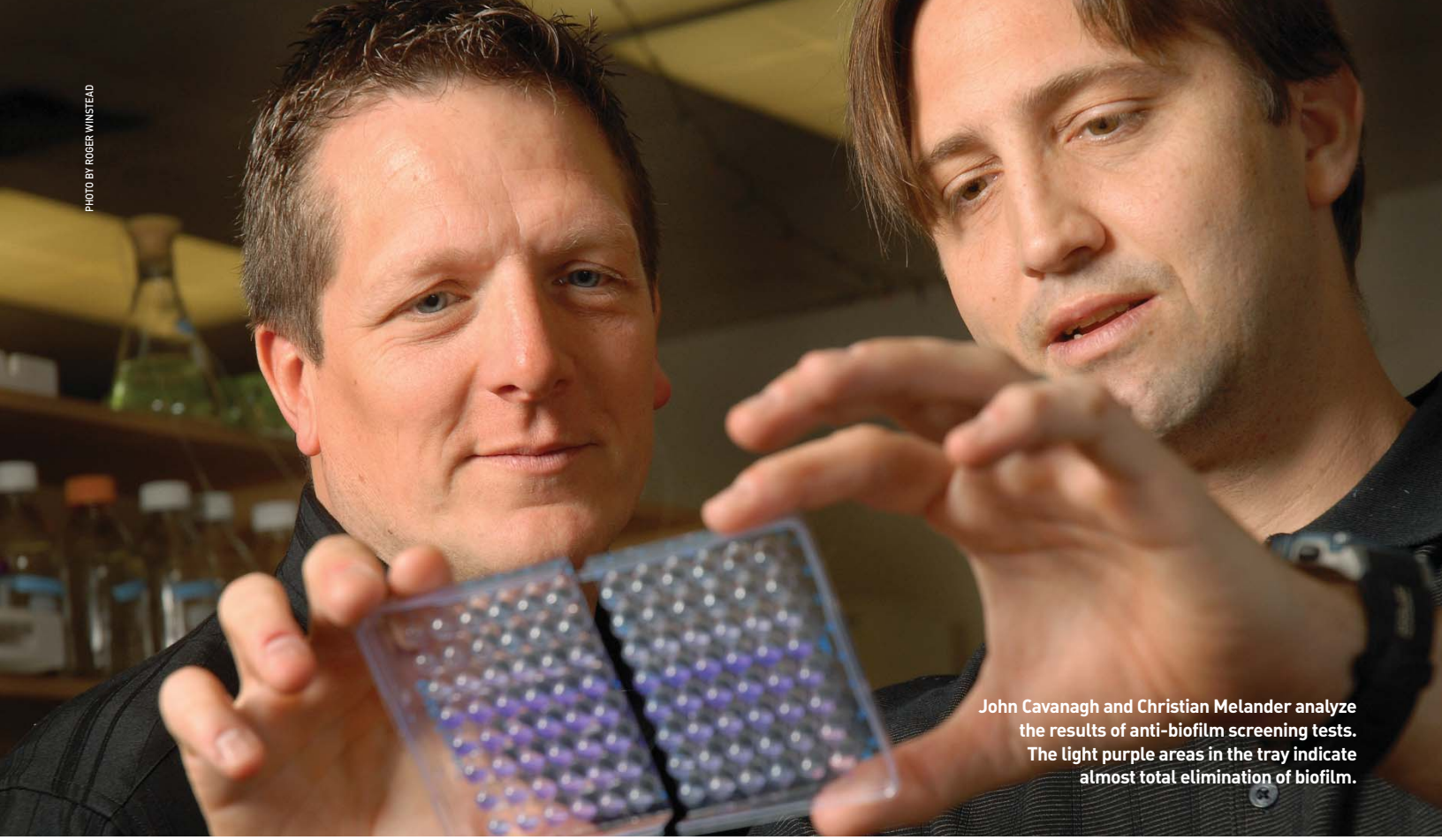

PHOTO BY ROGER WINSTEAD

John Cavanagh and Christian Melander analyze the results of anti-biofilm screening tests. The light purple areas in the tray indicate almost total elimination of biofilm.

Fishing for seafood safety

If you have been avoiding shellfish since having a brutal attack of gastroenteritis after eating oysters on the halfshell, you may have experienced an attack of a "superbug."

The bacterium *Vibrio parahaemolyticus* is the leading cause of seafood gastroenteritis in the U.S. Its cousin, *Vibrio vulnificus*, causes severe septicemia, has a hospitalization rate of 91 percent, and is responsible for 95 percent of U.S. seafood deaths.

In the U.S., *Vibrio* species cause about 41,000 illnesses yearly, increasing during natural disasters involving flooding. Following Hurricane Katrina, 17 cases of *Vibrio vulnificus* were seen – five of them fatal.

Christian Melander, assistant professor of chemistry, and John Cavanagh, professor of molecular and structural biochemistry, are taking a systems biology approach to stopping *Vibrio* infections.

"Our project integrates high-throughput comparative genomics methods, state-of-the-art structural biology, computational studies and drug design strategies," said Melander.

Comparative genomics efforts at the National Oceanic and Atmospheric Administration's Hollings Marine Laboratory will provide information about which gene signal pathways are responsible for *Vibrio* virulence, persistence and adaptability. Cavanagh's structural biology studies will examine those pathways in detail, providing therapeutic targets for Melander's team of chemists to exploit.

The virulence and persistence of *Vibrio* are due to its ability to form biofilms – communities of bacteria that respond differently than a single bacterium to ensure survival in hostile and shifting environments. In the biofilm form, *Vibrio* can be up to 10,000 times more resistant to antibiotics, as well as inherently resistant to the body's immune response.

Melander's research group has discovered a class of chemical compounds that inhibit the formation of biofilm.

"These compounds appear to be effective against not only *Vibrio*, but also several other drug- and immunity-resistant bacteria," said Melander.

Such "superbugs" include: *Haemophilus influenzae* (ear, eye, and respiratory tract infections); *Bordatella pertussis* (whooping cough); *Acinetobacter baumannii* (frequently found in hospitals, infecting patients through open wounds, catheters, and breathing tubes); and *Pseudomonas aeruginosa* (opportunistic infections of immuno-compromised individuals, including cancer and cystic fibrosis patients).

The team has a patent pending on the compounds and their uses and has formed Agile Sciences, Inc. With investor backing, the company will develop the product, recruit drug company partners, and advance products to clinical trials. The eventual products will treat surfaces where target bacteria lurk, including hospitals, medical devices and seafood processing equipment.

This research also has non-medical applications. For example, biofilms enable barnacles to stick to the sides of ships, where they cause drag. Preventing the formation of these biofilms would save the U.S. Navy about $1 billion in fuel costs every year. □

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