fect T-cells that regulate tissue homeostasis in a way that allows for wound healing while preventing scarring.

Their work has also had an immediate impact on the study of hydrangea root's traditional target, malaria. "There is a lot of excitement about antimalarial properties of halofuginone," says Whitman, noting that collaborators from Massachusetts General Hospital and the Harvard School of Public Health are pursuing studies of this application. "It is not only effective, but it is working on a completely different target from all of the other antimalarial drugs"—a particularly important development given the spread of malarial strains resistant to current drug treatments.

The long-term application of their work could extend to autoimmune diseases like inflammatory bowel disease and rheumatoid arthritis, and Whitman notes that researchers are already testing halofuginone in humans as a treatment for muscular dystrophy. "We'll see how that works," he says. "But we think there are definitely a lot of new directions to go in, all building on what nature provided." ~DAN MORRELL

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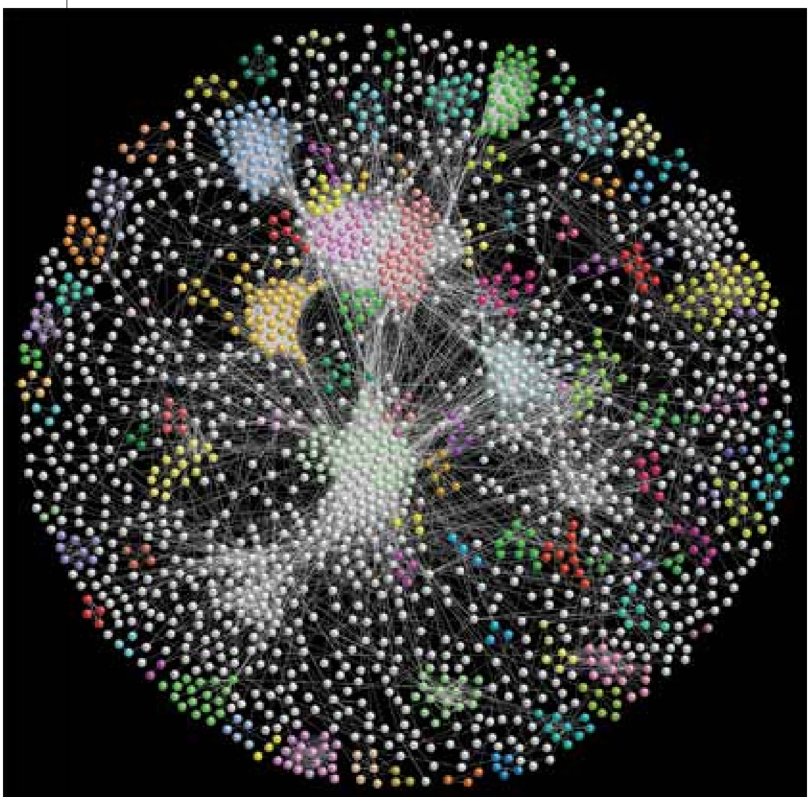
BONDS FOR WELL-BEING

A (Protein) Social Network



COURTESY OF SPYROS ARTAVANIS-TSAKONAS

A large-scale map of protein interactions in fruit flies provides new ways to study disease.

JUST ABOUT EVERYTHING the body does depends on the interactions of proteins—the molecules encoded by genes that serve as the primary workers in cells. "Without thousands of coordinating proteins, cells wouldn't function properly; even subtle problems in these interactions can lead to disease."

Spyros Artavanis-Tsakonas, professor of cell biology at Harvard Medical School (HMS), believes that to better grasp what can go wrong with proteins, scientists need to understand how these molecules function *together* (not just in isolation) in healthy cells. In the October 28 issue of *Cell*, his team published a large-scale map that tracks the interactions of thousands of proteins in fruit flies (*Drosophila melanogaster*). Since then, the researchers have continued to expand the map and delve into these connections in more detail.

The map was created through a painstaking process that Artavanis-Tsakonas compares to fishing. The scientists first randomly generated thousands of distinct proteins to serve as "bait," and introduced these proteins into *Drosophila* cells. When they removed the baits, they could see which proteins had adhered to them, thanks to the application of a highly precise technique, mass spectrometry, carried out by HMS professor of cell biology Steven Gygi. The result: a vast "social network" of proteins.

Although tiny fruit flies may seem to have little relevance to human disease, Artavanis-Tsakonas points out that "a lot of the basic biology is the same both in flies and humans," and flies are far easier to manipulate and study. With the new map in hand, his lab and other researchers can study how different conditions, diseases, or other perturbations change the protein landscape. They can better investigate the thousands of proteins with as yet unknown functions by tracking their associations with known proteins. And the map may also help identify new drugs; if a protein implicated in a disease is difficult to modify with a drug, the map will allow researchers to identify alternative targets for a similar drug in a protein's network. Although scientists have been working on similar maps, this is the largest of its kind for a complex organism. "We had enormous feedback" from other researchers about the map, Artavanis-Tsakonas says, and the data have been added to a public database for others to use. ~COURTNEY HUMPHRIES

HM▸ Visit harvardmag.com/extras to view a video on protein communication in a fruit-fly cell.

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