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Why America's Top Mental Health Researcher Joined Alphabet

Tom Insel explains why he's ready to give Silicon Valley a try.

by Antonio Regalado September 21, 2015

One of Thomas Insel's most dramatic initiatives as the government's mental-health research czar was to try to throw out the psychiatrists' bible, the *Diagnostic and Statistical Manual of Mental Disorders*, or DSM (see "[NIMH Will Drop Widely Used Psychiatry Manual](#)").



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It bothered Insel, who has been head of the National Institute of Mental Health in Bethesda, Maryland, since 2002, that

unlike AIDS or lymphoma, mental illness is still diagnosed on the basis of clusters of symptoms rather than “any objective laboratory measure” such as a biomarker or readout.



Tom Insel

In fact, biological science hasn't had that many successes against depression or schizophrenia, despite the NIMH's \$1.5 billion a year in grants and research spending. Psychiatric drugs haven't improved much in recent decades, and searches for the genetic causes of common forms of mental illness haven't yielded clear answers either. Such scientific frustrations may explain why Insel last week said he was jumping ship to join a subsidiary of Alphabet, the tech conglomerate formed in the restructuring of Google. Alphabet's Life Sciences unit is already exploring smart contact lenses, genomics, and cancer detection (see [“A Deeper Look at the New Google”](#)).

Insel notes the obvious: wealthy tech companies **have realized that health care is a bigger business than software and gadgets** (it's about 20 percent of the U.S. GDP), and so it's one they should get into. But he says he also became convinced that a tech approach might be well suited to mental illness, thanks to the “big data” being generated by genomics and medical imaging as well as the promise that personal technology could make health care “patient-centric” and continuous instead of focused on occasional doctor's visits.

“In the future, when we think of the private sector and health research, we may be thinking of Apple and IBM more than Lilly and Pfizer,” Insel says.

He's not envisioning yet another app for managing diabetes or heart disease. Rather, he thinks smartphones could collect biomarkers of depression or psychosis via speech patterns, and dole out psychiatric interventions as well.

We spoke to Insel about his decision to head to Silicon Valley.

How were you recruited by Alphabet?

I was at a meeting with the person [Andy Conrad] who subsequently became the CEO of this new company. He is quite interested in doing something in mental health, but that is not his background. We were talking about opportunities and it became clear we had similar interests. He asked if I would like to do it at Alphabet rather than in government.

What interests did you have in common?

There are three areas of really clear shared interest. One is trying to figure out a better way to bring data analytics to psychiatry. The diagnostic system we have is entirely symptom based and fairly subjective. A second was a concern over how we approach psychosis—that we could move earlier in the chain to develop a preëemptive approach. And the third was autism and developing biomarkers [to diagnose it].

Those are all very much in the strategic plan of the NIH. It's great to know that a company like Alphabet is also interested.

What would a preëemptive approach to psychosis look like?

It's something that we are also funding at the National Institute of Mental Health. We are developing algorithms to identify and analyze speech as an early window into the disorganization of thought.

Do you think you can do something different in Silicon Valley than in Bethesda, where you oversee such a large research enterprise?

We'll see. I wouldn't be making the move unless I thought there was a chance

to have a greater impact from the private sector.

We are at a really interesting moment in time. Technology that already has had such a big impact, on entertainment and so many aspects of our lives, can really start to change health care. If you ask the question “What parts of health care can technology transform?”—mental health could be one of the biggest.

Technology can cover much of the diagnostic process because you can use sensors and collect information about behavior in an objective way. Also, a lot of the treatments for mental health are psychosocial interventions, and those can be done through a smartphone. And most importantly, it can affect the quality of care, which is a big issue, especially for psychosocial interventions.

What do you mean by treating over the phone?

One of the best treatments for depression is cognitive behavior therapy. It's building a set of skills for managing your mood. You can do it with a phone as well as face to face. A lot of people with severe depression or social phobia or PTSD don't want to go in to see someone. This lowers the bar.

Is it possible to diagnose mental illness with a phone?

I'd say you can collect information over the phone that can help people manage their own treatment. Your question rests on a paradigm that is completely shifting. The old paradigm is you go to the doctor and they write a prescription. Whether you call it a diagnosis or just identifying the issue, there is an awful lot that can be done online. There is an attachment for your smartphone that can see the tympanic membrane, and pediatricians can make a diagnosis [of ear infection] online. It's a world where you want to get the right treatments at the right time for the right people. As a consumer, you are close to the source of the information. All of this is a different paradigm that we are moving into.

Is Alphabet's approach to mental illness going to be primarily technological or biological?

I don't know that. We are going to explore what the opportunities are. We know their sweet spot is in data analytics. What they do really well is figure out how to analyze data. The opportunity is to take that skill and answer biological questions. What that means in terms of what projects the life science team takes on in mental health is totally undefined. Part of my move there is to figure it out.

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Credit Image courtesy Tom Insel



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I am the senior editor for biomedicine for *MIT Technology Review*. I look for stories about how technology is changing medicine and biomedical research. Before joining *MIT Technology Review* in July 2011, I lived in São Paulo, Brazil, ... **More**

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Biomedicine

The Plan to Rescue Hawaii's Birds with Genetic Engineering

There's a chance to use cutting-edge technology to save native Hawaiian birds from the mosquitoes that are driving them to extinction.

by Antonio Regalado May 11, 2016

Ecologist Eben Paxton, speaking on a cell phone from somewhere in one of Hawaii's forests, wanted to talk about the scary events happening on the island of Kauai.

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The "bird crash," he calls it.

Hawaii's fourth-largest island, says Paxton, a scientist with the U.S. Geological Survey, is seeing a sudden, rapid decline in native birds.

The prime suspect is avian malaria. It's being spread by mosquitoes and it kills rare birds such as the 'i'iwi, a

bright red honeycreeper with a curvy Dr. Seuss beak. Surveys carried out on the island's rugged, roadless interior are finding fewer birds than ever before. Extinction for some species looks imminent.

So now a group of government officials, conservationists, and scientists in



Hawaii are seriously looking at a high-tech solution: genetically modified mosquitoes.

They say the modified bugs, whose offspring die quickly, thereby reducing mosquito populations, could be the best chance to save Hawaii's endangered birds. If these discussions move forward, one idea would be to release millions of genetically modified bugs to drive mosquitoes off of Kauai's plateau and maybe right out of the entire archipelago.

The discussions around the first "landscape scale" use of gene-modified insects are still at an early stage and have been coordinated by the U.S. Fish and Wildlife Service, which is responsible for endangered species. A spokesman at the agency's Honolulu office declined to confirm the agency's role, but said it was looking at "several" recovery plans for forest birds.



A threatened Hawaiian 'i'iwi at the Hakalau Forest National Wildlife Refuge. Half of Hawaii's birds are already extinct.

What's certain is that genetically modified organisms are political dynamite on Hawaii. Some districts have passed ordinances to ban biotech crops from being planted. No one knows how Hawaiians would react to GM mosquitoes, but lately, mosquito technology has been winning positive attention as a

potential high-tech fix for human diseases such as Zika. One company, Oxitec, **is testing GM mosquitoes in Brazil** and hopes to do so in Florida. Because of a genetic addition to their DNA, those bugs have offspring that die prematurely. Release enough of them and the number of mosquitoes can drop drastically, although they don't disappear altogether.

While fighting human disease gets the attention and the funding, conservation could end up being just as important a use of advanced biotechnology. At the San Diego Zoo, there are plans to **save the northern white rhinoceros** by cloning animals from frozen tissues. Scientists have created a **genetically modified American chestnut tree** resistant to the blight that's mostly wiped them out.

Extinction capital

Separated by 2,500 miles from the nearest land, the Hawaiian archipelago has a diversity of species even greater than Darwin's famous Galapagos Islands. But these organisms developed in such isolation that they weren't adapted to the threats brought by Western explorers and immigrants. These days, Hawaii is called the extinction capital of the world—434 species of plants and animals are listed as endangered by the United States. And more than half the native forest birds are already extinct.

Hawaii had no mosquitoes up until 1826. That's when, **historians say**, a whaling vessel that had taken on water in Mexico carelessly “drained dregs alive with wrigglers” into a stream on Maui. Soon avian malaria followed. By 1902, travelers reported a person could spend hours in the forest and “not hear the note of a single native bird.”

In fact, some birds had retreated to higher ground. Above 4,000 feet, it's too cold for *Culex quinquefasciatus*, the southern house mosquito, the one that gives malaria to birds. But these refuges are now under threat due to a warmer and wetter climate.

The situation is tragic. And a little bit fascinating. Because islands are isolated ecosystems, they're also a good testing ground for new conservation tactics.

That's what has mosquito experts studying the Hawaiian bird situation closely. One of them, Luke Alphey, is the scientist who developed Oxitec's mosquitoes and who now heads a group studying insect and spider genetics at the Pirbright Institute, in the U.K.

Alphey says he has a student working on modifying the culex species of mosquitoes troubling Hawaii's birds and thinks the technology would probably work, even on such difficult terrain as Hawaii's volcanic mountains. A couple of years ago, he wowed desperate ecologists with the idea when he visited Hawaii. "People loved it. This was the first time anyone had proposed anything that could change the whole discussion," says Dennis LaPointe, a mosquito scientist at the U.S. Geological Survey. "It got people thinking that molecular techniques are the way to go."

A decade ago, the U.S. Fish and Wildlife service said it would cost \$2.5 billion over 30 years to preserve honeycreepers and other forest birds, including by buying land and restoring habitats. But GM mosquitoes could be a much cheaper way to give the birds more time. "It seems to me it could be done economically," says Alphey. "It would cost a lot less than \$3 billion, that's certain."

The most urgent situation is on Kauai, a smaller island without a big mountain to offer the refuge of high elevations. In a prelude to extinction, wildlife officials are capturing pairs of honeycreepers in order to keep them in captivity.

No one has ever applied GM mosquitoes to such a vast landscape. Mosquitoes are too fragile to be tossed out of planes; some people have floated the idea of using drones. "A lot of these mosquito techniques have been applied to pretty small areas, but we are talking about thousands of square kilometers of rain forest," says Michael D. Samuel, a wildlife ecologist at the University of Wisconsin-Madison who has built computer models of the extinction threat facing Hawaiian birds due to climate change. "To me getting rid of wildlife disease over such a big area is hard. That said, the perfect place to experiment with these technologies is on an island. We know a lot about what's driving

the system and we can make predictions.”

Paxton says he is rooting for an all-out effort against the mosquitoes. He says people hope to see conventional sprays followed up with Oxitec-style bugs to drive down mosquito numbers and give the birds a respite from malaria.

Eventually, in a few years, a newer technology called a **gene drive**, also in development as a fix for human malaria in Africa, might be used to eliminate mosquitoes from the islands altogether. With that approach, mosquitoes are modified to spread a gene when they reproduce that eventually kills them all.

“It would be nice to get rid of the mosquitoes,” says Paxton. “Hawaii used to be a true bird paradise.”

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Tagged Hawaii, Oxitec, genetic engineering, extinction, mosquitoes, Eben Paxton



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