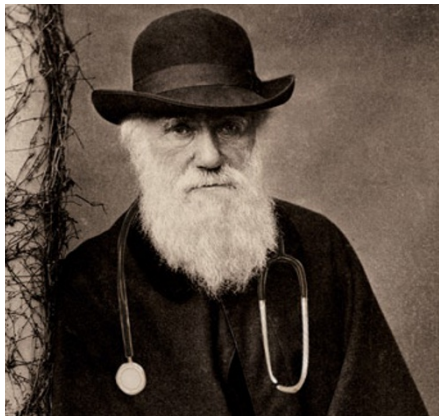
Universities evolve, looking to Darwin for new medical insights

Humans are the products of millions of years of evolution through natural selection. Yet when it comes to the treatment of disease, physicians and biomedical researchers have long neglected our evolutionary pasts. Now, a number of research institutes are attempting to remedy that by launching new research centers dedicated to the burgeoning field of evolutionary medicine.

The newly minted Center for Evolutionary Medicine at the University of Zurich opened its doors in late October. Backed by a $10 million donation from the private Zurich-based Mäxi Foundation, the center will focus on analyzing ancient DNA and bones as well as dissecting microevolutionary changes in human morphology to better understand modern diseases. "It's medical research, but it's looking from an evolutionary perspective," says the center's director Frank Rühli, a physician who has studied ailments such as atherosclerosis in Egyptian mummies.

In the US, the Center for Evolutionary Medicine and Informatics—one of ten research centers at Arizona State University's Biodesign Institute in Tempe—has been up and running since the beginning of the year. Under the direction of molecular evolutionary biologist Sudhir Kumar, the center is primarily focused on understanding disease through retracing the evolution of DNA sequence changes. "I think evolutionary medicine is exciting because of genomics," says Kumar. "Genomics allows one to ask ultimate causes of disease—like, why do some people get sick and others do not?"



From finches to flu: Medical research adapts.

Randolph Nesse, a psychiatrist at the University of Michigan–Ann Arbor who coined the term 'Darwinian medicine' nearly two decades ago, applauds the new centers' efforts. "The field really needs recognition that evolution has many different uses in medicine," he says.

But evolutionary biologist Stephen Stearns, another pioneer in the field from Yale University in New Haven, Connecticut, notes that both new centers are narrowly focused—primarily on the study of infections in ancient contexts in the case of Zurich, and on phylogenomics in Arizona. "I'd say that each of those [areas] is one fiftieth of evolutionary medicine," Stearns says, arguing that the discipline reflects a much broader application of basic evolutionary thinking to clinical practice and public health. "Evolution touches medical issues at many points."

Although neither new center is focused on medical or graduate training, many institutions around the world have created stand-alone courses to teach students about evolutionary medicine (*Nat. Med.* **15**, 1338, 2009), and Case Western Reserve University in Cleveland is taking the education approach one step further. According to Glenn Starkman, an astrophysicist and director of Case Western's interdisciplinary Institute for the Science of Origins, the university plans to launch a formal graduate program in evolutionary medicine in September 2012. "It's time that medical education gets more focused on evolution," he says.

Elie Dolgin

Half-century-old TB drugs get a facelift in new cocktails

The first-line regime of tuberculosis drugs has remained virtually unchanged for a half century. But instead of improving on these medications, some researchers say it's time to scour the lists of already-approved drugs for other indications or start from scratch to curb the more than 1.7 million deaths from tuberculosis (TB) each year.

In early November, for example, the New York–based TB Alliance announced the launch of a clinical trial to test a radically different drug cocktail. "We see this as a paradigm shift in methodology," says Ann Ginsberg, the organization's chief medical officer, "And it's been one that industry as well as regulators at institutions like the [US Food and Drug Administration] have been very supportive of."

Standard first-line treatment for TB consists of a cocktail of at least four drugs mixed and matched over six months. Because of side effects such as nausea, many people fail to properly adhere to this regime. And because 90% of the disease is typically cleared in the first few weeks, patients quickly see the medicine as causing more strife than the condition, says Mario Raviglione, director of the Stop TB Department, an international organization housed by the World Health Organization.

The recently announced phase 2 drug trial run by the TB Alliance will test a three-drug combination, dubbed NC001. It contains PA-824, an entirely new chemical compound, along with moxifloxacin (commonly used to treat pneumonia) and the common TB drug pyrazinamide.

What could potentially be even more important about the trial, however, is the streamlined form it is taking, Ginsberg says. Typically, introducing any single one of the drugs into a TB trial would take the form of swapping the drug out with one of the four most commonly used first-line drugs. By simply jumping to testing an entirely new combination, what could have been more than a three-decade-long process of trial and error could potentially be reduced to eight to ten years, Ginsberg adds.

Other researchers are taking a different approach to finding fast-track TB treatments. A team from the University of California–San Diego and the University of Leeds in the UK has examined the known proteome of the TB pathogen to find drug targets linked to hundreds of FDA-approved drugs (*PLoS Comp. Biol.* **6**, e1000976, 2010).

"There may be a great TB treatment out there that is already approved and could be repurposed to a TB market very quickly, if only we can find it," says Philip Bourne, a pharmacologist with the University of California–San Diego and lead author of the study.

There's still a lot of searching to be done before the work produces hits, Bourne says. The group's paper cites one drug currently used for neurodegenerative diseases that has some impact on TB but would have to be used in too-high doses.

Stu Hutson