The new project aims both to guide scientists towards more disease-associated regions, and to hasten much of the costly follow-up research. Sequencing 1,000 individuals will allow scientists to look at more types of variation — most notably, structural variation, in which large stretches of DNA are duplicated, deleted or rearranged in different individuals. And it will capture more rare variants than the HapMap, which aimed to catalogue SNPs present in 10% of the human population.

"This will give us a much more complete catalogue of genetic variation, and that is going to have a profound impact on our ability to understand the risk factors underlying disease," says Francis Collins, director of the National Human Genome Research Institute.

Yet some scientists question how accurate the finished genomes will be, given the project's short timeline and low budget. Others say that the project should have included some phenotypic information about the participants — such as medical records or basic data such as height and weight. "It's curious that the disease-association studies don't exploit much sequencing — and the sequencing studies don't use the disease data. It would be helpful to hear a clear explanation of why, after 17 years and billions of dollars, these studies still aren't coordinated," says George Church, who is leading a venture called the Personal Genome Project out of his lab at Harvard University in Cambridge, Massachusetts. Church's project is collecting and releasing genetic and phenotypic data on ten individuals, including himself.

"This is a historic turning point in genomics."

But leaders of the 1,000 Genomes Project say that their venture isn't large enough to give definitive answers about the genetic roots of traits. They also say that collecting phenotypic information might bias their study and raise difficult issues, such as how to protect participants' identities while still releasing all the relevant data. The project will not collect or release any information about its participants, beyond their ethnicity and genome sequence.

"No single study with 1,000 people is going to contain enough individuals with any condition to give you any power at all to say whether genotypes or phenotypes are correlated," Collins says. Such work is best left to follow-up studies, he says. ■

Erika Check Hayden

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Q&A: Larry Brilliant

R. GALBRAITH/REUTERS

He's a physician who has had a major role in the eradication of smallpox and in tackling blindness. Now Larry Brilliant is heading up Google.org, the dotcom giant's philanthropic arm, which plans to tackle emerging diseases, climate change and poverty. **Declan Butler** talks to him about his diseases strategy.

How will the organization work to anticipate new pandemics?

With our 'Predict and Prevent' initiative we hope to develop an entire new science of epidemiology and surveillance, both for existing diseases and to spot emerging ones early on. One way is to strengthen national health services — look at the polio surveillance system in India, for example, which is the finest for any disease. We are now funding the Global Health and Security Initiative's work on the Mekong Basin Disease Surveillance network, to boost diagnostic capacities, train people and help create a regional surveillance network for this hotspot, which covers Cambodia, China, Laos, Myanmar, Thailand and Vietnam. It is also using tabletop planning exercises with modern war-gaming techniques to better prepare a pandemic response. The Mekong project is about creating best practices that can then be transposed elsewhere. It's all about sharing data, visualizing data and creating the IT tools that people would like these countries to have to mount fast and effective responses.

But governments aren't always open about reporting disease outbreaks.

That's why we are supporting projects that use information technology to sift through news reports, blogs, electronic hospital records and other sources, in multiple languages, to identify reports of disease before official government reports. And we are supporting another project that enables individuals and health workers to report cases directly using cell phones to create a global network — this is going to be a big movement. So we've given $5 million to InSTEDD [Innovative Support to Emergencies, Diseases and Disasters], and $450,000 to HealthMap to start developing such systems. It's a new and embryonic field, it's exciting, and it's an area that Google.org wants to have a role in. We would like to support all of the players in this space to nurture a new industry. We are just at the beginning here.

I see Google is also involved in biology.

We want to detect emerging pandemic agents. Humans are increasingly coming into closer contact with animals in many places, creating hotspots where new diseases emerge by jumping the species barrier. So we plan to support work that takes paired blood samples from animals eaten for bushmeat in Africa, and from their hunters. This will create genomic maps of the viruses present, and reveal how these agents change over time. It's part of an entirely new chain of information gathering, which at some point will need to be centralized by the World Health Organization, the World Organisation for Animal Health or a non-governmental organization.

... and Earth-monitoring data?

We're also supporting Clark Labs at Clark University, with equal funding from the Gordon and Betty Moore Foundation, to develop systems to see how long-term Earth-monitoring data sets on climate change and variability, and soil moisture can be used to predict changes in ecosystems in Africa and the Amazon, and disasters such as drought and famine. An El Niño event might, say, predict a later drought in Mozambique. I'm a recent convert to this field of teleconnections. We want to advance this field of science. It is not yet well understood.

How are your relations with the Bill & Melinda Gates Foundation?

I love the Gates Foundation, they are wonderful people, and we will work with them. They have been so kind to me and Google.org. They invited us round to help us understand philanthropy and how it can best be used. When I heard Bill and Melinda speaking recently on their commitment to malaria, I had tears in my eyes.

The grants Google.org announced last week were small compared with those made by the Gates Foundation's Global Health Program.

It's too early for substantial funding but Google has set aside a generous amount for philanthropy — 1% of equity and 1% of profit. We've invested a total of US$75 million so far, but I consider these mostly exploratory grants. It is the beginning of a long process and we will be ramping up giving in the future. ■