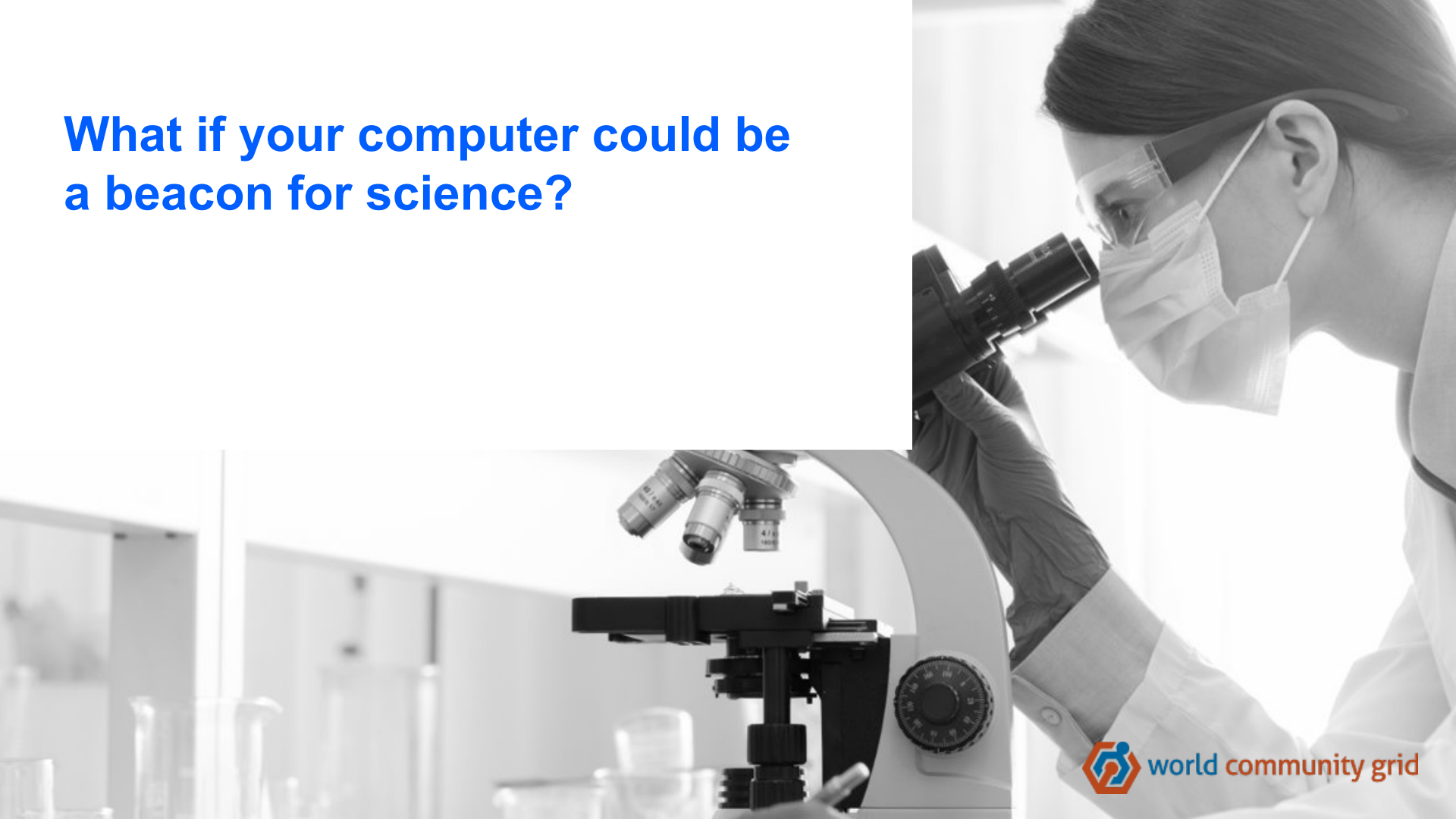
What if your computer could be a beacon for science?



world community grid

How it works

Cancer. COVID-19. The environment. Tuberculosis. The human microbiome.

When scientists need enormous computing resources to power their research on these or other crucial issues, World Community Grid draws on volunteers from around the globe to share the load.

By installing the World Community Grid app, volunteers donate their devices' unused processing power to carry out tiny virtual experiments.

In return, the scientists agree to make their results and data open to the research community. They do this by building online databases, publishing their findings, and creating open-source tools to accelerate computational research.

Scientific discoveries

Massive, donated computing power from World Community Grid has enabled groundbreaking discoveries, such as:

- Finding new potential treatments for one of the most common and dangerous forms of **childhood cancer**
- Identifying more than 36,000 compounds that could be cheaper, more efficient, and more flexible **solar cells**
- Discovering a phenomenon that can improve access to **clean water** for the nearly one billion people who lack access to it

Why scientists need you

By becoming a World Community Grid volunteer, you join a global movement that can help **make a crucial difference in scientific research** in scientific progress, especially during the largest global health crisis of the past 100 years.

Why this research matters

World Community Grid supports what is often termed “basic research.” Driven by curiosity about the unknown, it aims to build new knowledge that **lays the foundation for further study.**

This can include understanding the function of little-studied molecules, exploring an unexplained natural phenomena, or studying natural processes that are not well understood.

Basic research is the very beginning of scientific discovery–often without a guarantee of success–that **makes future discoveries possible**.

Discoveries in progress

World Community Grid is fueling the following discoveries in progress:

- From an original group of approximately 20,000 chemical compounds**, researchers are now conducting lab testing on 25 promising compounds** as **potential treatments for COVID-19**.

- A number of compounds are currently undergoing lab testing to determine if they effectively target **three important proteins** in the development of certain **childhood cancers**.

- Researchers have analyzed more than 300,000 (and counting) unique protein structures within the human gut microbiome and **created a new protein function prediction method**. This is important because this helps scientists determine which **proteins or biochemical pathways in the human gut microbiome may play a role in any number of diseases**.

- From an initial group of more than 36 million compounds, researchers identified **one synthetic compound** which showed considerable promise during first-round lab testing as a **potential treatment for the Zika virus.**

Current projects

OpenPandemics – COVID-19

Scripps Research (USA)

Africa Rainfall Project

Delft University of Technology (Netherlands)

Microbiome Immunity Project

Broad Institute of MIT & Harvard, University of California San Diego, Simons Foundation (USA)

Help Stop TB

University of Nottingham (UK)

Mapping Cancer Markers

Krembil Research Institute (Canada)

Smash Childhood Cancer

Hong Kong University (Hong Kong)

Accelerating the search for COVID-19 treatments

OpenPandemics – COVID-19

Scripps Research (with collaborators at Rutgers State University, Emory University, Dana-Farber Cancer Institute)

World Community Grid volunteers are helping Scripps researchers run computer simulations to evaluate potential treatments for COVID-19.

Scripps researchers are also developing tools and methods to help future drug discovery projects ramp up more quickly, which could help scientists respond faster to future pandemics.

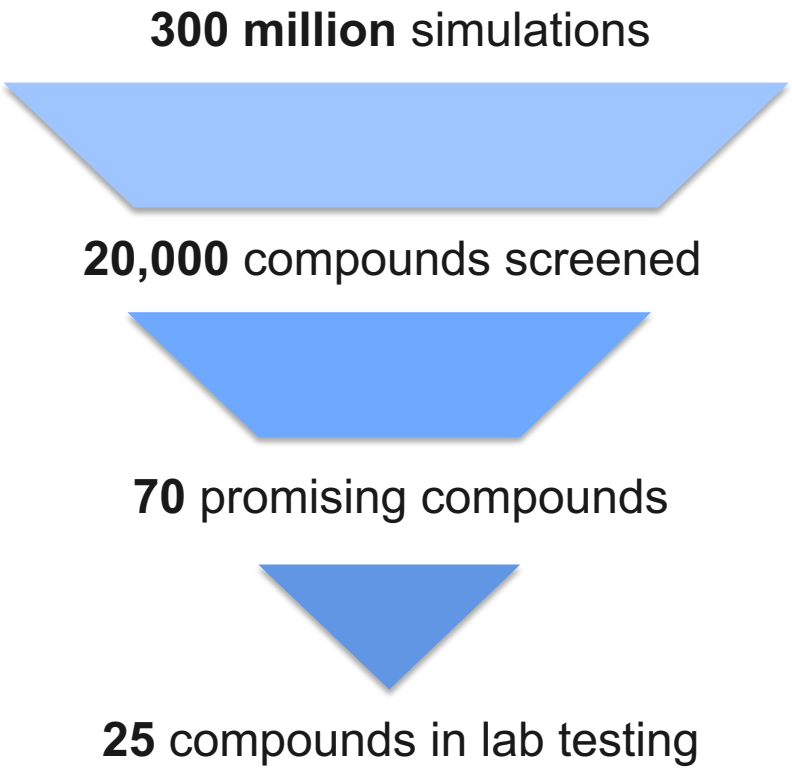
The results and data from the project will be made public so that everyone can benefit.

How might the data generated by this project be important to many scientists?

The data generated during the project could represent ideal starting points for the design of new classes of drugs to target COVID-19 and other coronaviruses.

Additionally, OpenPandemics - COVID-19 could build a model for the fast deployment of computational resources to help identify potential treatments during future pandemics.

Promising early results in the fight against COVID-19



"The compounds to be tested in this round and the following rounds are going to provide information that is invaluable not only to our project, but also to the broad scientific community involved in the fight against COVID-19."

Dr. Stefano Forli
Principal Investigator
OpenPandemics – COVID-19

Helping improve the odds for cancer patients

Mapping Cancer Markers

Krembil Research Institute

The project is analyzing millions of data points collected from thousands of healthy and cancerous patient tissue samples.

These include tissues with lung cancer, ovarian cancer, and sarcoma.

By comparing these different data points, researchers aim to identify patterns of markers for different cancers and correlate them with different outcomes, including responsiveness to various treatment options.

What are cancer markers?

Markers are specific genes (DNA segments), RNAs or proteins. These molecules may be found in blood or tissue samples, and specific combinations of these markers may be involved in a given cancer.

The Mapping Cancer Markers project focuses on discovering abnormal marker combinations, which may relate to cancer initiation and progression. It does so by comparing and analyzing data from many cancer patients and healthy control patients.

Mapping new territory inside our bodies

Microbiome Immunity Project

The Broad Institute of MIT and Harvard, Flatiron Institute of the Simons Foundation, University of California San Diego

To better understand the roles played by the various bacteria in the human microbiome, scientists need to study the proteins produced by these bacteria.

The first step is to determine the physical structures (shapes) of the protein molecules coded by each bacteria's genes. This is important because the physical structure of a protein determines its function.

Once the protein functions are determined, scientists can explore how the bacterial proteins react with each other, and determine which proteins play a role in any number of diseases, such as Type 1 diabetes.

What is the human microbiome, and why is understanding it important to human health?

Each of us have as many as 30 trillion bacteria living in and on our bodies. These bacteria, most of which live in our digestive systems, are part of a system called the human microbiome. Most of these bacteria are harmless or even beneficial. However, some have been implicated in disease.

Recent technological advances are enabling scientists to explore the human microbiome in detail for the first time. As scientists gain a better understanding of the role of human microbiome in the development of disease, they will be able to find and create better diagnoses and treatments.

Learning how to stop a global killer

Help Stop TB

University of Nottingham

TB is a slow killer, often remaining dormant for long periods of time before turning into active disease.

Although a vaccine and several drugs have been developed to help combat the disease, the TB bacterium has been evolving resistance to available treatments.

The TB bacterium has an unusual coating which protects it from many drugs and the patient's immune system. This project simulates the behavior of the molecules in this coating to better understand how they offer protection to the TB bacteria.

How prevalent is tuberculosis (TB)?

In late 2020, the World Health Organization released the most recent global statistics on TB, including the following:

- In 2019, an estimated 10 million people contracted TB.
- 1.4 million people died from TB in 2019.
- TB remains one of the top 10 causes of death worldwide, and the leading cause from a single infectious agent (above HIV/AIDS).

Improving weather forecasting for sub-Saharan Africa

Africa Rainfall Project

Delft University of Technology (with collaborators at Oregon State University)

In sub-Saharan Africa, 95 percent of agriculture depends on rainfall.

However, because rainfall in this area is often localized—sometimes almost at the level of one farm—it's difficult to forecast accurately with satellite data, which show larger weather patterns.

This project simulates localized rainstorms in sub-Saharan Africa at a very high level of resolution—exactly what's needed for localized rainstorms. This has never been done before for rainstorms in this region.

How can high-resolution simulations of rainfall patterns help farmers in sub-Saharan Africa?

As the researchers for the Africa Rainfall Project receive the results of these simulations, they'll be compared with historical rainfall data, satellite data, and ground observations. This will help scientists better understand these storms and improve forecasting models.

Ultimately, this can lead to more accurate rainfall forecasts for sub-Saharan Africa. In turn, this could give farmers more timely information about when to plant, help them obtain insurance, and become more resilient in the face of climate change.

Finding new and better treatments for childhood cancer

Smash Childhood Cancer

Hong Kong University (with collaborators at Saga Medical Center KOSEIKAN, Jackson Laboratory for Genomic Medicine, Children's Cancer Therapy Development Institute)

Researchers have identified proteins and other molecules that play key roles in certain childhood cancers.

The challenge is now to find chemical drug candidates—among millions of possibilities—that specifically target these key molecules and therefore control the cancer cells.

Millions of calculations run on World Community Grid are helping scientists identify the top drug molecules that are likely to control each of the target molecules found in cancer cells.

Why are better treatments needed for childhood cancer?

Every year, approximately 300,000 children are diagnosed with cancer and about 80,000 die of cancer.

In the past 20 years, only a small number of new drugs designed to treat childhood cancer have been approved by the US Food and Drug Administration.

Half of all the chemotherapy treatments used for children with cancer have been in existence for 25 years or longer.

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