

The Strongest Supercomputer on Earth Still Needs Your Laptop to Cure Cancer

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Volunteer computing and BOINC, once the future of research, are an ocean of unrealized promise. Why? Its creators don't have a way to reach out to you.

A group of California computer scientists has built a tool for analyzing climate change, mapping clean water access, and formulating strategies to eradicate malaria, cancer, and AIDS, all using a system they can rightfully claim to be the most powerful computer network on the planet. And here's what they want to talk about: How paltry the whole thing is. The [Berkeley Open Infrastructure for Network Computing](#) may be rocking 157 petaFLOPS ([and counting](#)), but it isn't nearly as muscular as scientists thought it would be when the idea of volunteer computing emerged in the mid-'90s.

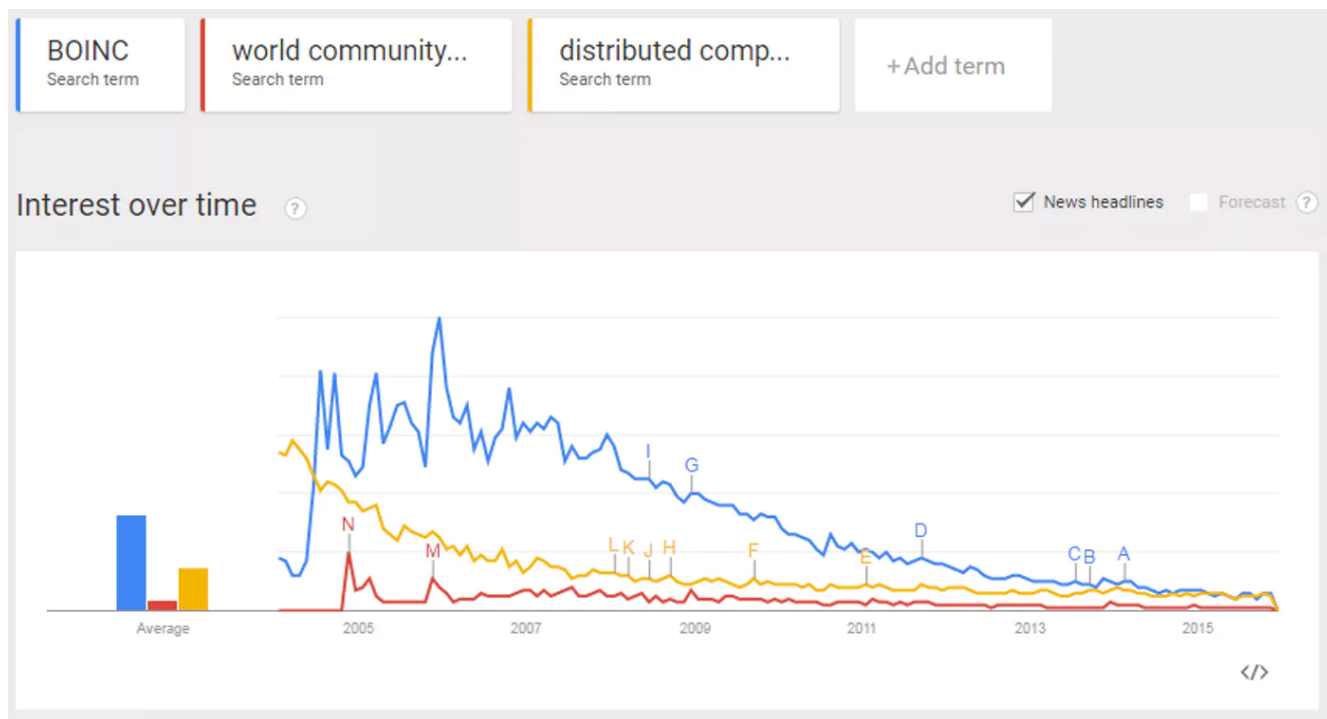
When it became clear in the early aughts that projects like BOINC and IBM's [World Community Grid](#) could leverage middleware use of the spare computing power on huge numbers of PCs to solve massively parallel problems (think: [scanning astronomical data to find extraterrestrial life](#) by running simulations, the consensus among researchers was that the future of data-driven investigation had arrived. In a sense, it had. The technology remains awe-inspiring, but it still isn't self-sufficient. In order to grow, BOINC needed to generate enthusiasm, to sign people up, to make studies of pulsars and peptides feel like a movement. That never happened.

I've been volunteer computing for BOINC since the late '90s, when I was an undergrad at the University of California-Berkeley. Since then I've installed the software on half a dozen new computers and tracked volunteer computing statistics as they have, depressingly, slumped. The attrition is easy to spot. The systems count millions of total volunteers, but the data make clear that only a few hundred thousand are actively returning results. And this for software that could run on machines numbering in the low billions globally. (If you want to join us, check out [this 10-minute guide](#) to getting started.)

Public relations efforts around volunteer computing have been uniformly amateurish. The sum of the project's recruiting is a page on BOINC's website that you have to really study to understand. And it's incredibly outdated, giving volunteers tips on how to write letters to computer magazines in countries around the world to boost exposure. "To get a magazine to write about BOINC," it reads, "you need to convince them that there's something new and exciting." The site also urges volunteers to update the page when and if they reach out to media, so as not to duplicate efforts. As of this writing, the last such update was in September 2014.

For an explanation, I reached out to [Dr. David Anderson](#), BOINC's project director, architect, and developer. He's an adjunct computer science professor at the University of Houston and a research scientist at the University of California-Berkeley, and is the project director of SETI@home. His day jobs don't allow for spending much time or funds pursuing volunteers to join in BOINC.

"We (BOINC or, prior to that, SETI@home) have never advertised; we have no budget for doing so," Anderson told me. Mass media coverage in the early days of volunteer computing about 15 years ago stirred some 2 million people to join the efforts, he says. "After that it was harder to get media coverage; outlets don't like to run stories that are similar to previous stories. Even for something like [the release of BOINC for Android](#), which I think is big, we were able to get only a smattering of coverage."



As media coverage of BOINC, World Community Grid, and distributed computing waned, so has public interest. Here are the trends in Google searches during the past decade.

For researchers like me, the untapped potential here is absolutely staggering. One of the active projects I've been following is Harvard's Clean Energy Project, which aims to identify next-gen solar cell materials. It uses World Community Grid's power to evaluate, so far, 2.3 million compounds for possible use as solar cells. That number, while impressive, is a blip compared against the project's ambitions. I emailed Dr. Alán Aspuru-Guzik, a chemistry professor who leads the project, to ask what a larger volunteer force would mean to him. Here's what he replied:

"My research group has huge hopes of understanding the entire molecular space, which is composed of 10^{60} to 10^{180} synthesizable molecules. So far, we have concentrated on the organic photovoltaics ('plastic' solar cells) area in collaboration with the World Community Grid. ... If I were to have say a hundred times more volunteers, we could turn the project into the 'Molecular Space Project' and we could undertake a vast cataloguing of a sample of a diverse set of molecules in chemical space to search for molecules with extreme properties for a variety of applications that could range from energy to technology and even health."

In other words, we could be cracking open the secrets of every extant or possible molecule. Instead, we're playing *League of Legends* and *Angry Birds Transformers*. And that criticism is actually reductively generous: We could be doing both.

To understand how regrettable this state of affairs is, we need to make a [rough estimate](#) of how much more computing capacity the world has in 2015 than in 2000. A [2011 study](#) by researchers at UCLA and in Barcelona found that between 1986 and 2007, that annual growth in computing power averaged 86 percent. If that pattern held during the past 15 years, the increase works out to more than a 10,000-fold leap. It's a shame that all that raw power just sits around [on your Galaxy S6](#) pinging your email server, or loiters on your Macbook waiting to download the latest iTunes update. Even with the tiny adoption rate, volunteer computing is accomplishing great feats: informing IPCC climate reports, the discovery of pulsars, the design of an artificial protein that triggers self-destruction of a certain class of cancer cells, and more than 150 scientific publications. BOINC's volunteers together contribute greater computing power to researchers

(for free) than would the world's most powerful supercomputer — a rig that cost \$390 million to build and which ain't cheap to run.

There are efforts afoot to make participating more attractive. One less altruistic reason you may want to join is the rising popularity, and value, of [Gridcoin](#). It's similar to Bitcoin, but its mining step is tied to BOINC research tasks that have real-world usefulness beyond the mere generation of cryptocurrency.

But even its intrinsic benefits are gratifying. Anytime I get frustrated with the pace of progress on my own research (using algae to improve wastewater treatment while generating climate-friendly biofuels) I simply remember that I'm also doing my tiny part to find cures for cancer and to make cheaper solar panels. That usually brings a smile to my face — though not that anyone much notices, when I'm staring at some spreadsheet in a darkened lab.

Best I can figure, here's why more people don't participate:

1) The government and other suppliers of research funding are reluctant to allocate resources for outreach.

This is nothing shy of fiscal foolishness. A few million more users for these supercomputing projects could boost American science and save the National Science Foundation money. But the NSF's mandate — the direct support of science — does not include mass advertising. The NSF does fund equipment, [including "high-end computer facilities"](#) and has several specific goals, such as to "foster and support the development and use of computers and other scientific methods and technologies, primarily for research and education in the sciences" that the expansion of volunteer computing efforts would help. And cheaply! More volunteers amount to free computing power for projects funded by the NSF and other agencies that support research. I should note that NSF does fund outreach, but usually in association with a specific research project. What is needed more is outreach about a larger concept that would benefit numerous current (and future) research projects across many fields.

2) The creators and operators of these projects tend to be academics who are evaluated primarily on their research output and the grants they bring in — not the number of volunteers they enlist.

This is a matter of priorities and of resources. But it's also a measure of how difficult it is for nerds at large to reach the public in great numbers. The volunteers who contribute to these projects fall in a painfully narrow band. Surveys by BOINC and the World Community Grid find that about 90 percent of volunteers are men, mostly older. Many are retired or work in IT. Their motivations, also tend to be focused on specific causes, rather than boosting science at large.

Ari Fishkind, a spokesman for [IBM Corporate Citizenship](#), which runs World Community Grid, confirms to me that it, too, has no advertising budget, and relies on word-of-mouth to drive enrollment. The big obstacle remains: Most people just don't know these projects exist.

3) The people running these services continue to reach out to the same groups who make up the vast majority of their volunteers.

I'm sympathetic to the difficulty that Fishkind and Anderson find themselves in: Overseeing world-changing networks with unknown potential, with no means to recruit for them. Still, given the findings of their surveys, I would've chosen a different tack. There are only so many male IT professionals in the world, so outreach must go beyond the tech/science bubble. The broader audience of self-proclaimed nerds milling around in the world keeps growing — how else to explain the continued dominance of *The Big Bang Theory*, or the rock-star pop culture status of [Bill Nye](#) and [Neil deGrasse Tyson](#)? The time has come to venture beyond solicitations to computer magazines into more mainstream outlets and social media.

This article is obviously about the unrealized promise of volunteer computing and, to that end, also a solicitation of your time and computing power. But the most important thing people can do to make BOINC and World Community Grid as powerful as they *should* be is to make volunteer computing a norm. In democracy, we can choose how to participate: voting, volunteering, rabble rousing. Technological progress isn't like that. Methodologies thrive on resources, not public debate. Those resource are — in the most literal way imaginable — at our fingertips. It's only the will that's lacking.

There may be a time when the default setting of every MacBook allows scientists to harness excess power to help cure cancer or find better materials for solar panels. There may be a time when we think of computer power as money — Bitcoin is pushing us that way — and we give back by donating a few calculations at a time. But years ago we expected that time to be now and it isn't. Given that volunteer computing requires almost no effort, there's no reason to think this is because of selfishness. We're just not used to the internet asking for something back. We need to get used to it.

Chat with the author of this piece on [Digg](#) today (12/21/15) at 12 p.m. EST

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