

Breaking through barriers to science with citizen science

The best way to care about science is to do science. I recognized this in middle school, when I tried to test what food ants like the best, watching a colony go after bread, lunchmeat, and chocolate. Now three years into my PhD I am still working with ants, and teaching the public about how our lab develops antibiotics from symbiotic bacteria that live on ants. Nothing captures attention as much as showing the live ants themselves. Nothing keeps attention better than asking people to try their own experiments. Much like my early experiments, the School of Ants project teaches students how to collect ants, record data and submit samples to a nationwide project¹. Anyone can do the experiments and help contribute to the project. If scientists want to better inform the public and keep them engaged, one of the best ways is by having the public participate in the science—known as citizen science.

Many fields already harness the power of public engagement to benefit both the scientists and the public. Citizen science, scientific work performed by the general public, gives the public the opportunity to pursue science—from counting bird populations to classifying galaxies—while scientists can use this form of crowdsourcing to collect and analyze data².

With the advent of technology ranging from wearable biosensors to cheaper sequencing costs, opportunities for biomedical citizen science are greatly expanding. A distinctly appealing aspect in much of biomedical research is how it teaches us about ourselves. Consider the example of the Human Genographic Project. This undertaking, sponsored by National Geographic Society and other partners, endeavored to sequence human DNA from a variety of populations to better understand human evolution³. For the donors providing DNA, they gained knowledge on their potential ancestors, as well as contributing to understanding how all human populations are connected.

The desire for knowledge has given rise to other companies such as uBiome, which sequences DNA of microbial communities on people's bodies⁴. The public's initial curiosity leads to more questions: what impact do these different microbes have on health? Wanting to know what their personal data means leads people to read more scientific news and stay informed.

With the increasingly availability of wearable technology, new possibilities arise for collecting more data and engaging increasing amounts of people. At the recent American Association for the Advancement of Science meeting, researchers studying Alzheimer's discussed the possibilities of technology enabling better recruitment and increased data in longitudinal studies. Longitudinal studies, like the Framingham Heart Study, led to new insights by studying people over time and in-depth, but the costs and difficulties in recruiting and keeping volunteers is a crucial problem. Researchers at the meeting showed how using online recruitment and collecting data remotely, through smart watches, biosensors, or improved online surveys and tests could improve the quality and yield of data. The access to more real-time data may be powerful for improved and personalized medical data.

Citizen science is not merely limited to data collection. Many research projects have found creative ways to bring their data to the public. One notable example is FoldIt, a game in which players compete for a higher score by folding proteins into more favorable positions². Using this game, players solved the structure of an enzyme critical in AIDS. Other researchers have used existing online games, like the massive multiplayer game EVE Online, and asked players to identify proteins in images in cells in return for in-game currency⁶. These games are a fun and rewarding way to attract people to science and benefit science overall by contributing human analytical skills towards solving problems.

By creatively using new technology, we can empower the public to connect to science by making meaningful differences with data collection and analysis. In order to use citizen science effectively in the biomedical sciences, there are hurdles in reliability, coordination, and ethics; however, previous citizen science projects have paved a path on ways to address these concerns⁷.

While many people view science as distant and difficult, some of the most notable contributions to science came from people with relatively little formal scientific training—from the first observations of microbial life by the businessman Antwon van Leeuwenhoek, to discovering the principles of genetics by the monk Gregor Mendel. Citizen science is an opportunity to invite the public to contribute to discoveries in science, and encourage a new generation of scientists.

Many citizen science projects have already produced fascinating results—from discovering new species of ants to determining the origins of different human populations. The advancement of technology in biomedical sciences is making citizen science projects achievable and valuable, helping the public learn about breakthroughs by contributing to them.

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