# EDITORIAL

## Citizen Science: Contribute to a Common Good, Collaborate, and Communicate!

Would you like to have unlimited access to be engaged in a variety of research projects of your own choice? — Would you like your undergraduate research to contribute to a significant public health, medical, environmental, or other socially significant cause? — Would you like your data to be publicly available on an open database that is well curated and maintained? — Would you like to be engaged in research throughout the calendar year?

Citizen Science (www.citizenscienceassociation.org) engages diverse participants in thousands of research projects on local, regional, national, and global scales in the collection, interpretation, and use of scientific data on a particular scientific problem. Many examples empower the participants to engage in decision making about major issues such as: loss of biodiversity; evolutionary resistance to antibiotics, pesticides, herbicides, and cancer chemotherapy; identification of cancer clusters; monitoring effects of global warming and pollution into streams and ground water; spread of invasive species; folding proteins for possible development of HIV/AIDS drugs; and, identification of new pulsars, quasars, and stars with earth-like planets.

In a previous essay, I collaborated with undergraduate editors of the Journal of Young Investigators to assert the importance of undergraduates being authors, reviewers, and editors rather than just serving the interests of their advisors.[5] AJUR has been an important voice in this conversation as it continues to publish vetted undergraduate authored research papers.

Too often, access to doing research as an undergraduate has been sorely limited to primarily rising seniors with high grade point averages, limited availability of funding, restrictions to prestigious research universities or private colleges, etc. Furthermore, because of decreased federal funding for research, too often many research projects serve corporate rather than societal needs.[2] With the advent of new research efforts in participatory action research (PAR), crowdsourcing, open access, do it yourself (DIY) science, Maker Spaces, etc., numerous opportunities exist for anyone interested in a particular area to become engaged in a project where the data that you collect will be of interest to an external professional community.

You can choose from a broad range of citizen science: (1) "crowdsourcing — citizens as sensors" (e.g., contributing your labor or access to your computer); (2) "distributed intelligence — citizens as basic interpreters" (ranges from finding pulsars in telescopic images to solving protein folding problems or improving multiple sequence alignments); (3) "participatory science — participation in problem definition and data collection"; and, (4) "co-created" — ("designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process") — "extreme — collaborative science — problem definition, data collection and analysis".[1, 6, 7]

As more students engage in a variety of citizen science projects, some core concepts of research that will be explored are: risk, uncertainty, expertise, transparency, credibility, trust, deliberation, complexity, participatory democracy, deliberative polling; citizens' juries, consensus conferences, foresight exercises, science shops, and citizenship. By engaging in citizen science, more students will also be introduced to the field of Science and Technology Studies (STS) to address such questions as: How do information, science, policy, and governance come together? How can students play an important role in deciding, observing and contesting how science and technology are being developed and implemented for the good of humanity and the natural world?

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