

## The Origins and Future of the Citizen Sky Project

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Citizen Sky arose as a product of the 2009 International Year of Astronomy (IYA) project. Aaron Price was appointed to the U.S. IYA Program Committee when it was first constituted in 2006. After about a year of planning, the committee established a Working Group for Research Experiences for Students, Teachers, and Citizen Scientists with Aaron as the chair. The goal was to use the IYA initiative to promote citizen science projects to the general public. The group met for the first time at the Astronomical Society of the Pacific meeting in Chicago—2007. At the meeting they decided to focus their efforts around one project instead of promoting a slate of projects. Many specific ideas were discussed during a morning meeting, but nothing caught the excitement of the entire group.

In the afternoon, Aaron had a hallway discussion with Rick Fienberg, then editor-in-chief of *Sky & Telescope* magazine. Rick mentioned the upcoming  $\epsilon$  Aurigae eclipse as a possible topic. He had previously co-presented a paper on the topic with Robert Stencel (“Dr. Bob”) at the 2006 meeting of the International Astronomical Union. It seemed like an ideal project. And as the working group researched it more, it became more and more enticing.  $\epsilon$  Aur is bright enough to be seen from the city, its eclipse has an amplitude that can be detected with the naked eye, it happens very rarely, it is difficult for professionals to monitor (due to limited large telescope time) and, above all, it was still an enigma—even after over a century of research and speculation.

U.S. IYA funding was a constant issue. The Program Committee only had enough funds to support a small staff and a few projects. The Working Group knew that any project they came up with would be targeted at a narrow audience and so would not receive the same level of support from the Program Committee that a more generalized topic—such as the Galileoscope—received. So the Working Group came up with two plans. One was aimed at what they would

do with zero funding—what each member of the group could contribute gratis and/or can do as part of their regular job. For the AAVSO, this meant issuing an *Alert Notice* on the topic, making charts, and running a regular campaign, but not much more. They also came up with a program to implement if they could raise substantial levels of support. After these two plans were in place, they looked for funding.

The National Science Foundation (NSF) seemed like a natural fit. They fund citizen science, have a nice history with the AAVSO, and the working group had some experience writing proposals for them. However, strong NSF proposals are not easy to assemble. It took almost six months to write the Citizen Sky proposal. Aaron wrote a draft, circulated it amongst the Working Group, and then they held conference calls to discuss revisions. The process went very smoothly, but took a lot of time.

AAVSO Director Arne Henden was chosen as the project's principal investigator (PI) because Aaron did not yet have a Ph.D. (he was in graduate school at the time). All of the co-PIs contributed to the proposal. In addition to Aaron, they were Lucy Fortson, Jordan Raddick, and Bob Stencel. Ryan Wyatt also contributed to the proposal and was a member of the advisory board along with Chris DuPree, Suzanne Jacoby, Hee-Sun Lee, and David Anderson. The proposal itself was originally called STARS—Science Through the Astronomical Research of Stars. It was after funding that it was changed to Citizen Sky, a name first proposed by Rebecca Turner.

Robert Stencel served as scientific advisor from the very beginning. The original idea to involve web cams and DSLR cameras began with him. He provided much needed scientific advice and also a welcome sense of humor when things got tight and deadlines loomed. He also recruited a graduate student of his, Brian Kloppenborg, into the project.

By the time we submitted the proposal to the NSF's Informal Science Education (ISE) program, which funds their citizen science projects, the budget had increased to about \$796,000 for a three-year project. It was an interdisciplinary project with funding for modeling software, workshops, a high-end planetarium show, journal publication, Science Olympiad materials, and much more. The scientific goal of the project was to collect data to help researchers uncover what is causing the  $\epsilon$  Aur eclipse. The educational goal was to involve the public in all aspects of a scientific project. Instead of focusing solely on data collection, the project aimed to train participants to analyze data, pose their own research questions, and write up results for a peer-reviewed journal. This had not been done before in a large scale citizen science project, and the AAVSO was in a unique position to do so thanks to our history of having an engaged membership. The goal with Citizen Sky was to put it all together in one package and make it accessible to novice amateur astronomers with the belief that participants will get a better understanding of the scientific method if they are more engaged with it at every step of the way.

The proposal was submitted in June 2008. In November 2008 we received the word that it had been favorably reviewed by the NSF. Over the next few months we answered questions and responded to suggestions from the NSF to strengthen the project. In mid-April 2009 we finally received official notification that the project would be fully funded. However, we were new to the NSF so there were substantial administrative tasks to complete before funding could begin. This additional delay caused a problem because, as we all know, the sky waits for no one. The eclipse was predicted to begin in the latter half of the year and we needed pre-eclipse observations. In the original proposal we planned to have almost a year to build the project, materials, and so on, before the eclipse began. Now we had to do a year's work in a few months.

Rebecca Turner was assigned the position of Project Manager, meaning she was responsible for overall implementation of the project. Dr. Bob was the scientific advisor. Brian Kloppenborg was hired as a staff member to assist Rebecca. The first author was funded to conduct an evaluation of the project, which eventually morphed into his dissertation at Tufts University. The Morrison Planetarium at the California Academy of Sciences, acting under Ryan Wyatt, was contracted to produce an eight-minute planetarium film for the project. The Adler Planetarium and Astronomy Museum, acting under Mark SubbaRao, was hired to develop an interactive eclipsing binary modeling software. Jordan Raddick at Johns Hopkins was hired to consult on web site development, which was mostly done by Kate Davis, the AAVSO webmaster at the time.

The first year of the project was dedicated to building infrastructure and data collection. The web site was officially launched in June 2009. It consisted of simplified versions of WebObs, the light curve generator, and the Quick Look file, tutorials on observing and reading light curves, online forums, and a blog maintained by the staff and Dr. Bob. The first Citizen Sky workshop was held in September 2009 at the Adler Planetarium in Chicago. The focus of the workshop was on data collection (visual, photoelectric, and spectra) and on the science behind the system.

The second year of the project was dedicated to building teams and training in data analysis. The non-observing aspect of Citizen Sky was designed around the concept of teams of participants working together. It was inspired by the success of the chart and comparison star database teams that were active in the AAVSO in the previous decade. A second workshop was held in August 2010 at the California Academy of Sciences in San Francisco. The focus of that workshop was on data analysis and writing scientific papers.

The third year of the project was dedicated to observing the end of the eclipse and writing papers for the *Journal of the AAVSO (JAAVSO)*. This was a less publicly active period as the teams worked on their papers, most of which are published in this edition of *JAAVSO*, about  $\epsilon$  Aur, Citizen Sky, and related topics.

So what is happening next with Citizen Sky? One of the lessons we learned in this project is that teams can indeed do great work. Evidence of that is in

this *AAVSO* issue. However, some teams did not achieve their goals. There are many reasons for this, but in our view there was one overall lesson to learn: project staff cannot appoint leaders of teams; they have to grow organically from among the participants. The most successful teams were mostly the ones that had self-nominated leaders. The teams which had staff-invited leaders were less successful, with a few notable exceptions.

At the end of the third year of the Citizen Sky Project the AAVSO received a supplemental NSF grant to fund a third workshop. This workshop will focus on generating a manual for DSLR Photometry. Applications will be accepted in late 2012 and early 2013. It will take place March 22–24, 2013, at AAVSO Headquarters in Cambridge, Massachusetts. The program will comprise a mix of 1) talks by experienced DSLR photometrists and 2) breakout sessions during which small groups of participants (each with a designated leader) will develop preassigned sections of the manual. These groups will be determined well in advance and will be based on participant interest, experience, and skills. No prior DSLR experience is required, but there will be some pre-workshop reading and preparation required. The workshop will produce an easy to use, introductory manual that will help the AAVSO support observers who are interested in giving DSLR photometry a try.

With the conclusion of the  $\epsilon$  Aur eclipse and news of the DSLR workshop, the AAVSO has given Citizen Sky a new mission: to be the new home of the AAVSO's bright variable star activities. Initially, the Citizen Sky area of the AAVSO website will host the AAVSO Binocular Observing Program and the DSLR Photometry Program. Additional bright object programs/projects will be added to the Citizen Sky pages as they develop. Important Citizen Sky materials will be moved from its existing website to the Citizen Sky section of the AAVSO website. The original Citizen Sky website will be frozen in 2013 but will stay online as an archive.

As for staff, they have also built on what they have learned as part of this project. Dr. Brian Kloppenborg, who received his Ph.D. at Univ. of Denver in spring 2012, is now a visiting scientist at the Max Planck Institute for Radio Astronomy in Bonn, Germany, working on interferometry. He continues to involve amateur astronomers in his research. Dr. Aaron Price is now Manager of Research and Evaluation at the Museum of Science and Industry in Chicago, where he is applying the social science research skills he learned through his dissertation on Citizen Sky's impact on the scientific beliefs of its participants. Rebecca Turner has been promoted to Operations Director at the AAVSO, where she is applying many of the project and personnel management skills she learned as Project Manager of the Citizen Sky project. Dr. Arne Henden continues as Director of the AAVSO, and Dr. Robert Stencel continues as a professor at the University of Denver, and is now planning observations for the next eclipse of  $\epsilon$  Aur in 2036!