

# CITIZEN SCIENCE: Tools for Advancing NASA Research and Discovery



**Presentation to NAC Science Committee  
November 2, 2015**

# Overview

- What is citizen science? Why citizen science?
- USG attention to citizen science
- Citizen science at NASA – now
- Citizen science at NASA – moving forward

# Citizen science defined

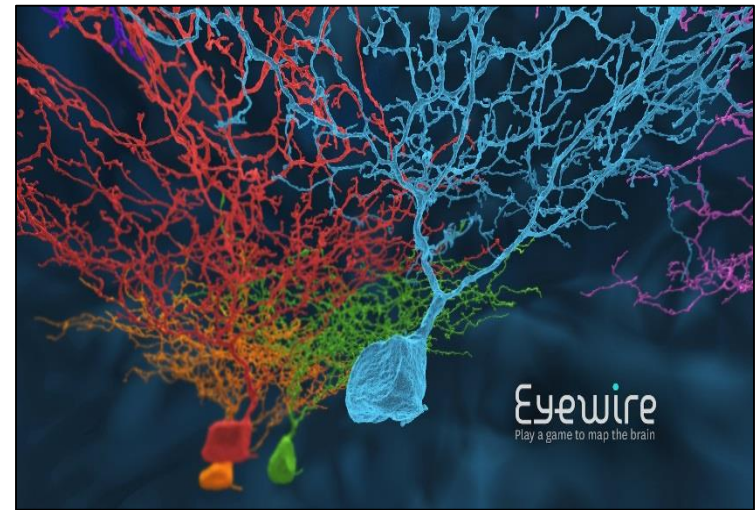
The participation of the public in the scientific process to address real-world problems in ways that include:

- Identifying research questions
- Designing/conducting investigations
- Collecting data
- Analyzing data
- Developing data applications
- Developing technologies to advance science
- Solving complex problems



Citizen science employs many open innovation methodologies including crowdsourcing, community-based research, challenges, prizes, gaming, and making.

# Citizen science is booming!



# Citizen science's value proposition

- Foremost, citizen science can help get more science done more efficiently
  - Collect data with improved spatial/temporal resolutions
  - Analyze Big Data more rapidly and where computer algorithms don't suffice
  - Generate new ideas for data applications/technologies
  - Citizen science results are appearing in published scientific papers, while some projects have received standard research funding.
- Citizen science also facilitates other goals, including education; public awareness of scientific developments, methods, and agency missions; and public scientific literacy/interest

Citizen science can be valuable when scientific problems are decomposed properly and when projects are designed properly.  
It is another approach to advance science.



# Enthusiasm for citizen science is growing across the U.S. government

- Federal Community of Practice for Crowdsourcing and Citizen Science
- Open Government Initiative emphasizes public participation
- FY17 EOP R&D budget memo encouraged citizen science activities
- Released on September 30:
  - Federal citizen science toolkit
  - OSTP/Holdren memo promoting agency citizen science use
  - NSF has made citizen science a core priority area
  - Sen. Coons introduction of Crowdsourcing and Citizen Science Act



# NASA's citizen science universe

- + NASA-funded but not NASA-led
- ^ Uses NASA data/assets but not NASA-designed
- \* Completed/defunct

## Disk Detective

\*Cassini Rings Challenge

+Mercury Mappers

\*Mars Balance Mass Challenge  
Mars Ascent Vehicle Challenge  
+Mars Mappers  
\*Clickworkers  
^Planet Four

+Moon Mappers  
^Moon Zoo

\*Open NASA Earth Exchange Challenges  
NASA S'COOL  
NASA/USGS Adopt-a-Pixel  
GLOBE  
Ecological forecasting using crowdsourcing  
\*Climate Resilience Data Challenge  
  
\*Astrobiology Citizen Science  
\*MAPPER

+Stardust@home

Aurorasaurus  
Meteor Counter

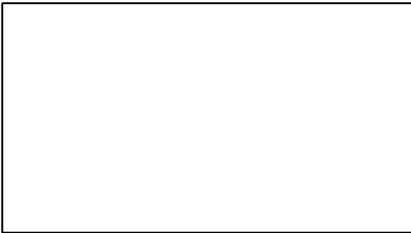
+Target Asteroids  
+Asteroid Mappers  
\*Asteroid Data Hunter Challenge  
Citizen science Asteroid Data,  
Education, and Tools (CADET)  
Apophis 2029

\*3D Space Challenges  
\*ISS Longeron Challenge

International Space Apps  
challenges (many)



# Citizen science successes at NASA



- 130,000+ observations from all 50 states and 50+ countries on cloud type, height, and cover helping NASA validate atmospheric data gathered by satellites
- Participant discoveries of interstellar particles in aerogel containing samples returned to Earth
- 1.5 million classifications of 278,121 disk candidates in 19 months (plus researching targets for follow-up observations, analyzing follow-up data, translating website into foreign languages)
- Awarded \$20,000 for idea to study Martian atmosphere by releasing material that could be seen and studied by other Martian spacecraft in orbit and on the ground



# Recent NASA citizen science programmatic developments

- NASA policies endorsing citizen science (2014 NASA Strategic Plan recognizes individual citizens as NASA partners; NPD 1090.1 encourages use of open innovation approaches)
- OCS leading steering/coordinating committee, in partnership with SMD, OCT, et al.
- NASA citizen science forum and list serve
- Internal efforts to create internal awareness of citizen science as a research tool
- New project solicitations/awards
  - Citizen science Asteroid, Data, Education, and Tools solicitation in ROSES
  - OCS Science Innovation Fund – 2 citizen science awards
  - SMD E/PO CAN awards with citizen science elements
- NASA Solve “one-stop-shop” for public to find opportunities

# Efforts in progress

- Considering new avenues to create internal awareness and knowledge of citizen science and crowdsourcing tools
- Considering inclusion of more science-based opportunities through the International Space Apps Challenge (April)
- Examining potential of inviting citizen science solicitations via ROSES
- Ongoing discussions with SMD to assess how/where citizen science could advance NASA science and other goals