### COSMOQUEST

Building communications, collaboration, and perhaps a Skinner Box for Science







Astronomy Cast: A - Adrian Q.





#### What about Citizen Science?

+ <u>Volunteers from the Public</u> New Knowledge





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Humphreys and Revelle (1984) Motivation results from a mixture of one's desires and needs and involves a component of arousal and effort.

Theories usually center on questions of expectancy, need, learning, and role.

Galaxy Zoo	Moon Zoo	Description (to be used in survey)
Contribute	Contribute	I am excited to contribute to original scientific research.
Astronomy	Lunar Science	Lunar science is important for future exploration.
Discovery	Discovery	I might discover something scientifically interesting.
Beauty	Images	The wonderful LRO images are amazing to see.
Vastness	Nearness	I am in love with the nearby Moon.
Science	Science	I am interested in science.
Ζοο	Zooiverse Project	I'm interested in everything the Zooniverse does. I want to see how the project works.
Help	Help	I am happy to help.
Fun		I had a lot of fun categorizing the galaxies.
Learning	Learning	I was looking for ways to learn about the moon.
Teaching		I find Galaxy Zoo to be a useful resource for teaching others
Community	Community	It is fun to make friends from all around the world.
	Apollo	I am a child of the 1960's and have a personal interest.

#### Yeung's octagon model of volunteer motivation

- Getting / Giving
  - Contribute
  - Help
  - Learning / Teaching
- Action Getting Action / Thought Proximity / Distance (typically emotional) - Nearness of the Moon / Continuity Proximity Vastness of the Universe Newness / Continuity - Zooniverse / This Project Distance Newness - Discovery / Science, Astronomy, Lunar Sci, Child of Apollo Thought Giving

#### Improving on engagement

Users feel lost

-> Need instructions and in-your-face tutorials

- Leave due to lack of feedback (afraid to give false data)
   -> Provide feedback when others confirm their results
- Don't feel like they are part of an active community (forums)
   -> harder to fix ...





Users, Expert



Astronomy Cast: A - Adrian Q.

#### **ARTISTS SPACE**

40°

7100

CONTRACTOR

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Astronomy Cast Episode 246 - What If Something Was Different?



Live Telescope Observing - the Moon



### Community Building



## **365 D**ays of Astronomy



#### Projected Science



# **Guerilla Science**





# **CosmoAcademy**



## **Citizen Science**



## **DIY Science**









### inspire

### engage

### educate



<u>CosmoQuest</u> is a production of <u>the STEM Center at SIUE & Astrosphere New Media</u>, in association with <u>Universe Today</u>, <u>Bad Astronomy</u>, & numerous <u>partner organizations</u>. To find out how your organization can get involved, email getinvolved (at) cosmoquest org.



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#### **Clustering Code**

Huang, Lehan, Gay + Richardson

Input: X, Y, D, confidence

#### **Parameters:** *reachability*, ε<sub>1</sub> & ε<sub>2</sub>

Nthreshold

#### if( (distance( $p_i, p_j$ ) < $\epsilon_1 * (D_i + D_j) / 2$ ) and ( $|D_i - D_j| < \epsilon_2 * \min(D_i, D_j)$ ))

Based on 2-dimensional DBSCAN (Density-Based Spatial Clustering of Applications with Noise) code developed by Ester et al. (1996).





N=[all], D=130±4.3 px (±3% diam, ±2% position) N=38, D=135±17 px (±13% diam, ±4% position)



N=[all], D=117±4.3 px (±4% diam, ±2% position) N=31, D=112±17 px (±15% diam, ±6% position)





N=[all], D=124±13 px (±10% diam, ±3% position) N=24, D=112±19 px (±17% diam, ±7% position)



N=6, D=143±16 px (±11% diam, ±7% position) N=18, D=135±22 px (±16% diam, ±8% position)



#### **Comparing Individuals**

- experts
  - \* 5-10% scatter in location \* 5-10% scatter in diameter \* preservation effects error
- volunteers
  - \* 10% scatter in location
  - \* 20% scatter in diameter
  - \* preservation has no effect

#### **Aggregate Results**

There is a 1:1 relationship between experts and volunteers







#### Peer-reviewed research produced by:

MoonMappers - demonstrated accurate crater mapping
 Ice Investigators - Aided discovery of KBOs for NH

**Discovered problem:** Researchers require funding in order to meaningfully participate.

#### Current









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#### A few upcoming examples

- Image Detective, Earth
- Planet Builder, Astrobiology
- Dark Energy Explorer, Astrophysics
- Asteroid Mappers: Bennu, Planetary

#### Timeline

- May, RFP announced
- Sep, proposals due
- Jan, announce new programs



### Community Building



## **365 D**ays of Astronomy



#### Projected Science



# **Guerilla Science**





# CosmoAcademy



## **Citizen Science**



## **DIY Science**



## Educators' Zone









#### **Partner Institutions**

- The STEM Center @SIUE, lead
- Astronomical Society of the Pacific
- DeAnza College
- InsightSTEM
- Interface Guru
- Lawrence Hall of Science @UC-Berkeley
- McREL International
- Planetary Science Institute
- McDonald Observatory @UT-Austin
- Ward-Beecher Planetarium @YSU

#### **Mission & Facility Partners**

- CADC
- Dawn
- Hobby-Eberly Telescope
- Lunar Reconnaissance Orbiter
- New Horizons
- MESSENGER
- OSIRIS-REx
- WFIRST



#### **Community Partners**

- Astronomers without Borders
- Astrosphere New Media Association
- Galileo Teacher Training Program
- International Sci. & Eng. Festival
- NASA Museum Alliance
- NASA Night Sky Network
- NASA Solar System Ambassadors
- St Louis Science Center
- S. Arizona Research, Sci. & Eng. Festival
- SETI Institute
- Universe Today
- WGBH, PBS Learning

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