

Crowdsourcing, Citizen Science & GEOSS

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UCL

@mhaklay / @UCL_ExCiteS

Outline



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- Three eras of environmental information – from experts to the public
- Crowdsourced geographic information & citizen science – typology and examples
- Common issues and challenges: data quality, interoperability and reuse, privacy, motivations and incentives

First era: 1969-[1987-92]



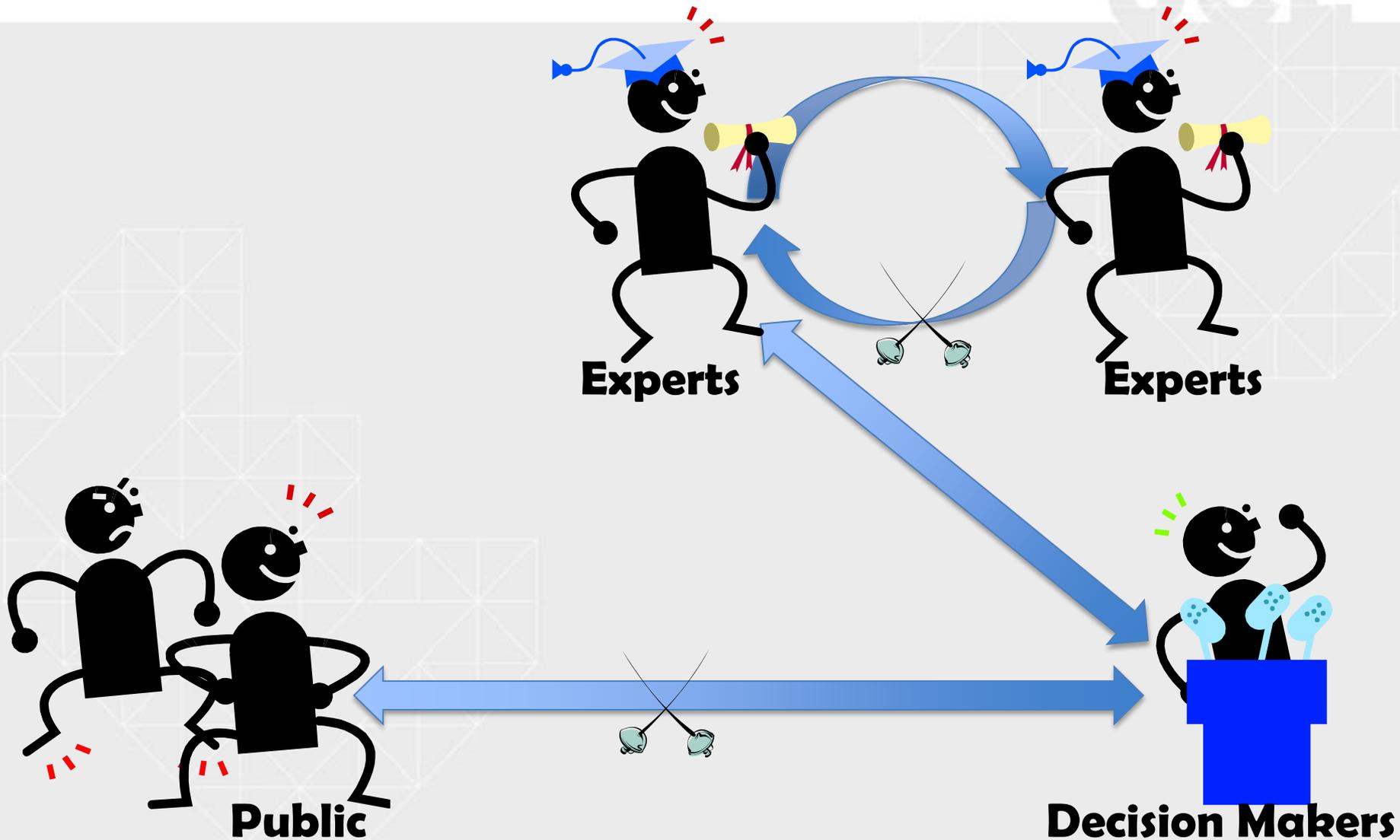
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- Experts responsible for creating environmental information and using it to advise government
- Top-down attitude to environmental decision making
- ‘Information Deficit’ model towards the public
- **Environmental information by experts, for experts**

First era: 1969-[1987-92]



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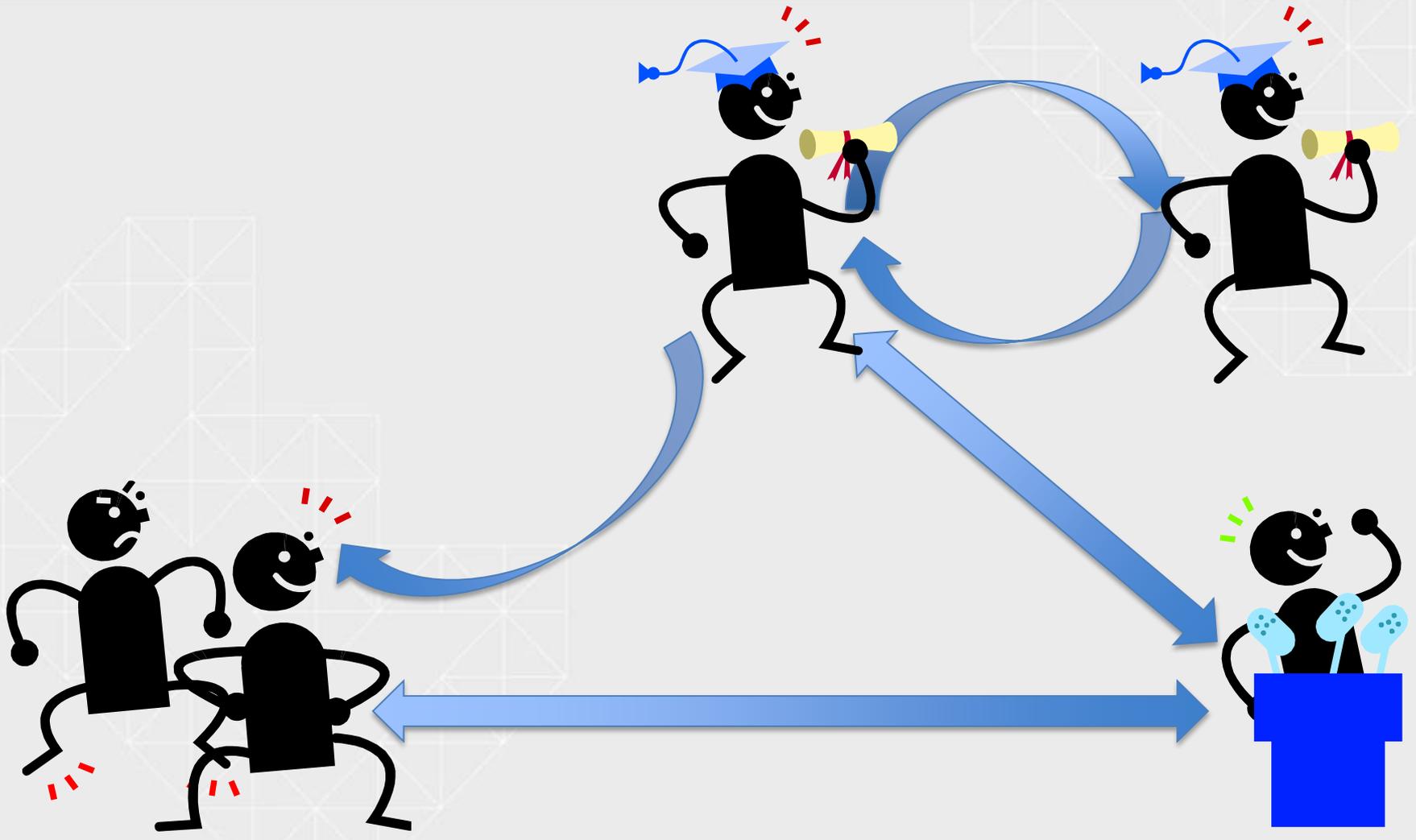
Second era: 1992 – [2005-12]

- Rio Principle 10, Aarhus Convention
- Public access to environmental information is a prerequisite to participation, civil society organisations as intermediaries
- The Web as *the* dissemination medium
- **Information by experts, for experts and the public (but in expert form)**

Second era: 1992 – [2005-12]



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- Prof. Jacquie McGlade, head of European Environment Agency, 2008 (Aarhus + 10):

'Often the best information comes from those who are closest to it, and it is important we harness this local knowledge if we are to tackle climate change adequately.. people are encouraged to give their own opinion on the quality of the beach and water, to supplement the official information.'



WaterWatch - Bathing water quality for Europe

The screenshot displays the EEA WaterWatch web application interface. On the left, a sidebar titled "Official data" lists bathing water quality categories: Unknown, Excellent, Good, Sufficient, Insufficient sampled, Poor, and Closed. The main map area shows a coastal region with several data points represented by colored icons. A "Citizen Observation Layer" dialog box is open, allowing users to interact with the data. The dialog box includes a "Rating" section with five icons: Very bad, Bad, Moderate, Good, and Very Good. Below this, there are checkboxes for various attributes: Clean, Safe, Scenic, Equipped, Dirty, Polluted, Unsafe, and Crowded. The dialog also shows the edit time as "Edited seconds ago" and includes "Delete" and "Save" buttons. The top navigation bar includes options for "Rating tool", "Print", "Layers", "Basemap", and "Share", along with a search bar for "Find address or place". The bottom of the interface features the "bing" logo and the "European Environment Agency" logo.

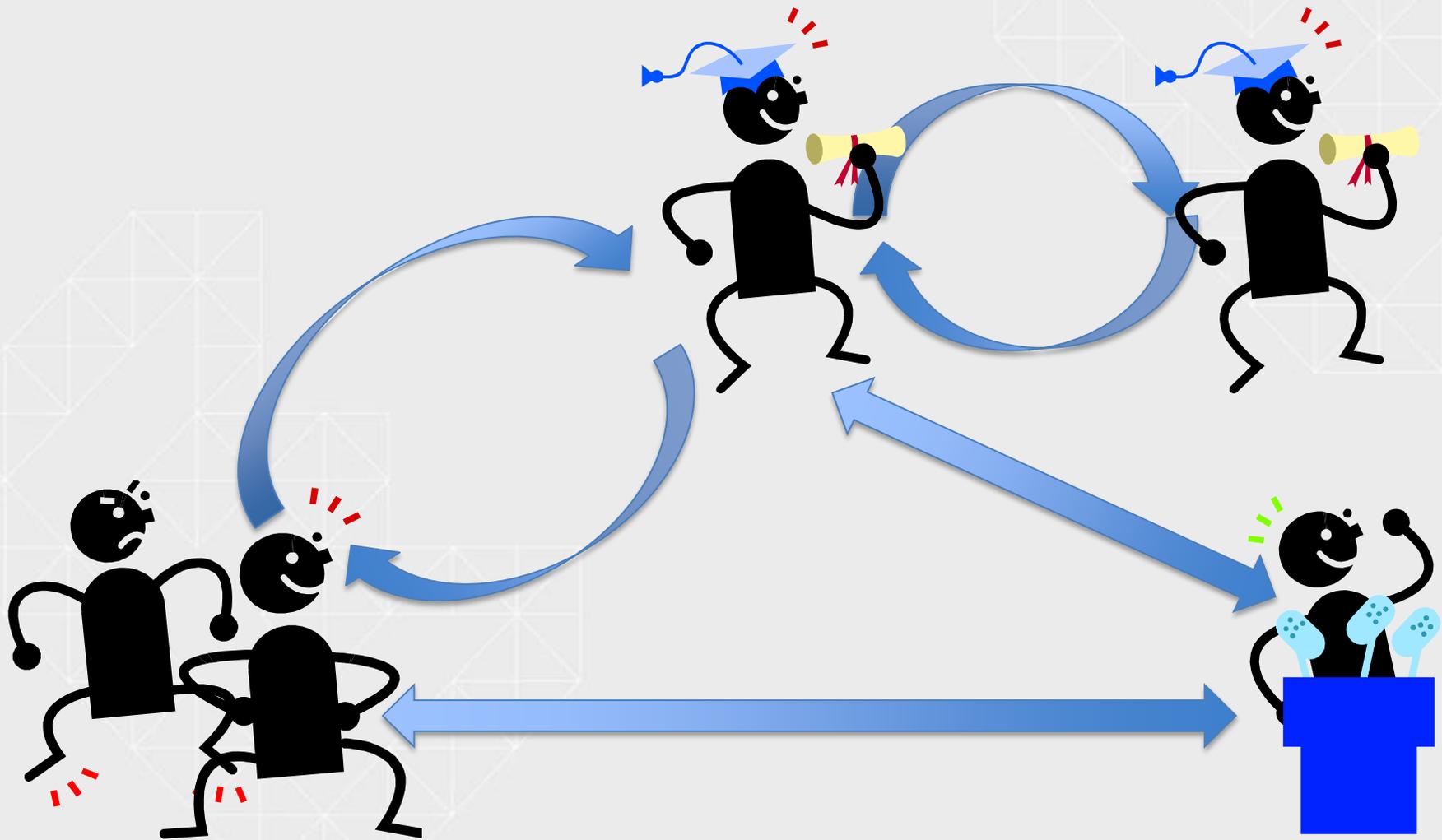


- As Part of Strategic Area 3 activities:
'to widen and deepen the European knowledge base by developing communities of practice and engaging in partnerships with stakeholders beyond Eionet, such as business and research communities, Civil Society Organisations (CSO), **and initiatives concerning lay, local and traditional knowledge and citizen science**'

Third era: Since 2012



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2006

Crowdsourcing/VGI



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OpenStreetMap - Firefox

File Edit View Go Bookmarks Tools Help del.icio.us

http://www.openstreetmap.org/edit.html?lat=51.52243511821698&lon=-0.128496&zoom=15

OpenStreetMap OpenStreetMap

View Edit GPS traces

Welcome nickblack1@gmail.com [Logout](#)

OpenStreetMap



The Free Wiki World Map

Help & Wiki
News blog
Shop

User

display name:
Nickb



Need help editing?



lat: 51.52509103370292, lon: -0.11976273357868197

4.278s Mostly Cloudy, 18°C 15°C 18°C

Nick Black



UNIT



Terminology



- Neogeography
- (Geographical) Citizen cyberscience
- Volunteered Geographic Information (VGI)
- Crowdsourced geographic information
- User generated spatial/geographic content
- Participatory/Collaborative GIS
- Pervasive/Urban/Collaborative sensing
- The Internet of Things

Oxford English Dictionary (2014)

citizen science n. scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.

citizen scientist n. (a) a scientist whose work is characterized by a sense of responsibility to serve the best interests of the wider community (now rare); (b) a member of the general public who engages in scientific work, often in collaboration with or under the direction of professional scientists and scientific institutions; an amateur scientist.

History

- Mary Anning (1799-1847).
Palaeontologist
- Worked outside official research structures.



Volunteer rainfall observer Rick Grocke checks the rain gauge at Tanami Downs cattle station in the Northern Territory of Australia



Jennifer Jewett / USFWS



© WMO—No. 919

Participating in Christmas Bird Count

The era of professional science

- Involvement continued: archaeology, astronomy, ornithology, biodiversity, conservation, meteorology ...
- No recognition, views of volunteers as 'untrustworthy' contributors

Citizen science



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- While Citizen Science has a long history, new forms emerged in the past decades, facilitated by the web - 'citizen cyberscience'
- Types:
 - biodiversity/conservation observations recording;
 - volunteer computing;
 - volunteer thinking;
 - Do It Yourself (DIY) science;
 - community/civic science

Biodiversity/conservation/ field studies



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Comprendre Agir S'engager Qui sommes-nous? Nos Programmes Actualités Presse Liens utiles Contacts



Nos programmes

- Observatoires de la Biodiversité des Jardins
 - Connaître les papillons
 - L'Observatoire des Papillons des Jardins
 - L'Opération Escaragots
 - Aménager son jardin
 - Outils et Lettres d'Info
 - Le Forum
 - Le coin des écoles
 - Nos relais en régions
 - Agenda des relais
 - Partenaires
- Jardins de Noé
- 50 000 Observations pour la Forêt
- Eclairage durable & Biodiversité
- Poisson-scie, Guinée-Bissau
- Autres programmes

PAPILLONS Jardin

nos vies sont liées

- Présentation
- Comment participer et envoyer ses données?
- Cartes d'identité des papillons
- Cartes d'identité des papillons de la liste complémentaire
- Outils pour faciliter la saisie
- Résultats 2012
- Foire aux questions

Présentation

Observatoire PAPILLONS Jardins

Malgré leur importance dans les écosystèmes on possède aujourd'hui encore trop peu d'informations sur les populations de papill et leur évolution. Alors dès maintenant, cor les papillons dans votre jardin et devenez membre de l'Observatoire des Papillons de Jardins. Toutes les observations comptent, papillons comptent sur vous!

Saisissez vos données en ligne sur le site de l'Observatoire.



Argus bleu céleste

Avec leur grande diversité et leurs exigences écologiques variées, les papillons sont de précieux indicateurs de la qualité des milieux naturels, et c de la santé de nos écosystèmes. Aujourd'hui, le F nombre de biologistes professionnels fait que les données disponibles sur les papillons demeurent insuffisantes. Les réseaux d'amateurs sont plus q jamais indispensables pour alimenter en données observatoires de la biodiversité, en étroite collab avec des scientifiques.

Noé Conservation et le Muséum national d'Histoire naturelle ont donc lancé l'Observatoire des Papillons des Jardins. Le principe est simple : tous les utilisateurs de jardin invités à regarder les papillons, à les identifier et transmettre leurs observations aux scientifiques c Muséum. On peut participer une fois ou régulièrement il n'y a pas d'engagement, il n'est pas nécessaire connaître déjà les papillons : c'est facile et tou les observations comptent!



Home About Submit Observations Explore Data My eBird Help

Sign In or Register as a New User Translate to: English | Español | Français | Português

Welcome to eBird

Birding in the 21st Century.

News and Features

Cornell Lab eBirders head to Israel for Champions of the Flyway

25 March 2014

Champions of the Flyway is a major new international bird race taking place in Eilat, Israel – one of the world's most spectacular migration hot spots and rewarding birding destinations. Competing teams from around the world will try to find, identify and log as many species as possible – as they go head to head in an intense 24 hour contest to win the coveted title "Champions of the Flyway". While the race will be fun, the goal is serious – to raise conservation funding that will help BirdLife International tackle the illegal killing of birds in Southern and Eastern Europe. We are pleased to be attending to highlight the challenges that migratory birds face in southern and eastern Europe and help develop the international eBird community. Our team consists of eBird Project Leaders Chris Wood and Marshall Illiff, and Merlin Project Leader, Jessie Barry. Unfortunately, we just learned that our fourth team member, Kerem Boyla, will not be able to join due to a strike at the Israeli embassy.



The Cornell Lab of Ornithology



Help Support eBird



BirdCast Real-Time Bird Migration Forecast

eBird Rarity Photos Pool



Introducing the eBird Location Explorer!

20 March 2014

eBird's new Location Explorer is designed to be a "dashboard" overview for a region, quickly summarizing the information birders find most useful at the regional level (e.g., country, state, or county). You can keep track of recent birding activity, such as what's happening at your favorite locations, who's been birding lately, and explore recent checklist submissions. You can help plan your birding trips by discovering the best places to find birds in a region. You can compare your stats with those of other eBirders in a region, and see how your county, state, or country ranks compared to others. We encourage you to explore the world using eBird's new Location Explorer!



Jan Meerman, February 2014 eBirder of the Month

8 March 2014

Please join us in congratulating Jan Meerman of Green Hills, Belize, the winner of the February eBirder of the Month Challenge. sponsored by Carl



UK Environmental Observation Framework

Understanding Citizen Science and Environmental Monitoring

Final Report on behalf of UK Environmental Observation Framework by: Roy, H.E., Pocock, M.J.O., Preston, C.D., Roy, D.B. & Savage, J. NERC Centre for Ecology & Hydrology

Tweddle, J.C. & Robinson, L.D. Natural History Museum

November 2012



Volunteer computing



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SETI@HOME
Needs your Help
Donate to SETI@home
Click Here for More Information

What is SETI@home?

SETI@home is a scientific experiment that uses Internet-connected computers in the Search for Extraterrestrial Intelligence (SETI). You can participate by running a free program that downloads and analyzes radio telescope data.

PARTICIPATE

- Download
- Get help
- Tell a friend
- Donate
- Porting & optimization
- ... more

ABOUT

- About SETI@home
- About Astropulse
- Science newsletters
- Technical news
- Server status
- Science status
- Sponsors
- ... more

Get started

- 1 [Read our rules and policies](#)
- 2 **Download, install and run** the BOINC software used by SETI@home. When prompted, enter the URL: <http://setiathome.berkeley.edu>

Have questions or need help? Contact a volunteer using [BOINC online help](#).

Special instructions:

- [For SETI@home Classic participants](#)
- [For users of command-line and pre-5.0 clients](#).



Keep your computer busy when SETI@home has no work - [participate in other BOINC-based projects](#).

User of the day



Den.
How are you? I'm Superior science youth living in Tokyo, Japan. I love all sciences and technologies!

Copyright © 2010 University of California

SETI@home and Astropulse are funded by grants from the National Science Foundation, NASA



- HOME
- ABOUT QCN
- JOIN QCN
- NEWS
- LEARNING
- RESEARCH
- MY QCN/BOINC
- HELP DESK



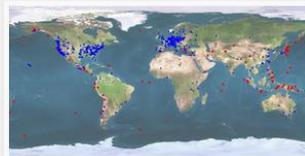
Check out the new sensors!

The new O-NAVI sensors have been received and are ready to ship!

[READ MORE](#)

The Quake-Catcher Network

The Quake-Catcher Network is a collaborative initiative for developing the world's largest, low-cost strong-motion seismic network by utilizing sensors in and attached to internet-connected computers. With your help, the Quake-Catcher Network can provide better understanding of earthquakes, give early warning to schools, emergency response systems, and others. The Quake-Catcher Network also provides educational software designed to help teach about earthquakes and earthquake hazards.



LOG IN

Please use your E-mail to log in. If you don't have an account, click REGISTER.

[REGISTER](#)

Username

Password

Tasks

FightAIDS@Home - Vina
World Community Grid
ready 75.0%

Elapsed time: 04:03:30
Task Name: FAHV_x3NF6_B_IN_FBPb_rig_0205859_0382_8
Deadline: Sat 29 Mar 2014 07:10:29 pm

FightAIDS@Home - Vina
World Community Grid
ready 20.0%

Elapsed time: 02:07:44
Task Name: FAHV_x3NF6_A_IN_Y3a_rig_0205304_2274_4
Deadline: Sat 29 Mar 2014 09:40:34 pm

Computing will resume when battery charge reaches 90% (currently 73%)



You can join World Community Grid at <http://www.worldcommunitygrid.org/>



Volunteer thinking



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Welcome to Galaxy Zoo, where you can help astronomers explore the Universe

Galaxy Zoo: Hubble uses gorgeous imagery of hundreds of thousands of galaxies drawn from NASA's Hubble Space Telescope archive. To understand how these galaxies, and our own, formed we need your help to classify them according to their shapes — a task at which your brain is better than even the most advanced computer. If you're quick, you may even be the first person in history to see each of the galaxies you're asked to classify.

More than 250,000 people have taken part in Galaxy Zoo so far, producing a wealth of valuable data and sending telescopes on Earth and in space chasing after their discoveries. The images used in Galaxy Zoo: Hubble are more detailed and beautiful than ever, and will allow us to look deeper into the Universe than ever before. To begin exploring, click the 'How To Take Part' link above, or read *The Story So Far* to find out what Galaxy Zoo has achieved to date.

Thanks for your help, and happy classifying.

The Galaxy Zoo team.

GeoTag-X Beta version 1.1

Projects About Feedback

Hey! You are an anonymous user. Sign in now! Sign in

Somali Drought

This project investigates what informatio...

Projects 3

Under Development

These projects are under development

Projects 4

Yamuna Monsoon Flooding 2013

The Yamuna River is dying from industrial...

Projects 6

Yemeni Agricultural Water Assessment

This module was created for UNOSAT's a...

Projects 1

Ebola response

Assessing use of personal protective equi...

Projects 2

Emergency Shelter Assessment in the Middle East

This project is about assessing the suitab...

Projects 2

geotags.org/app/category/underdevelopment/



See Zooniverse projects at <http://www.zooniverse.org/>



DIY Science



Tidmarsh Farm, MA, June 6-8, 2014
Northeast Barnraising

Public Lab: now a 501c3 non-profit
Make a tax-deductible donation today



Balloon Mapping Kits »



Public Lab's 2013 Barnraising

October: 50 Public Lab members from around the world spent 4 days [working together at the 2013 Barnraising in New Orleans](#) focusing on education, from curriculum development to field methods.

Like 799 Follow @PublicLab Tweet 214

Public Lab

is a community where you can learn how to investigate environmental concerns. Using inexpensive DIY techniques, we seek to change how people see the world in environmental, social, and political terms.

Join now » Log in

Public Lab is made up of:



An open community of contributors

Learn about and help to develop



A set of experimental tools

Browse and freely download the



A network of local groups

Find a nearby chapter or start one yourself to find local



More information at <http://publiclaboratory.org>





Community/Civic Science

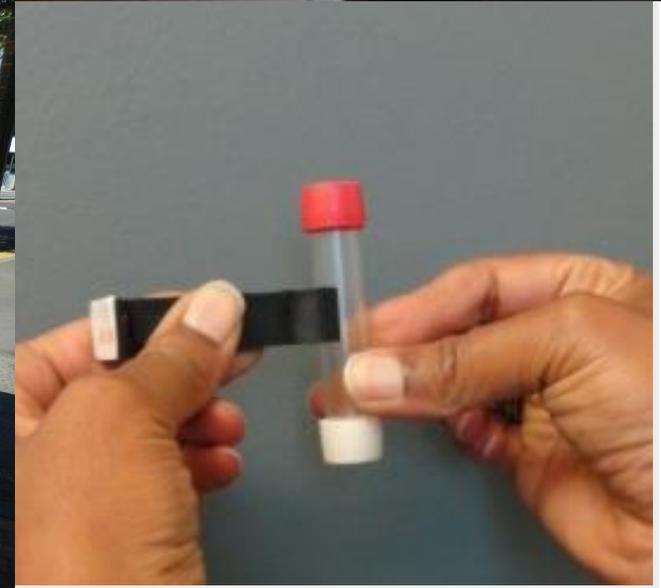
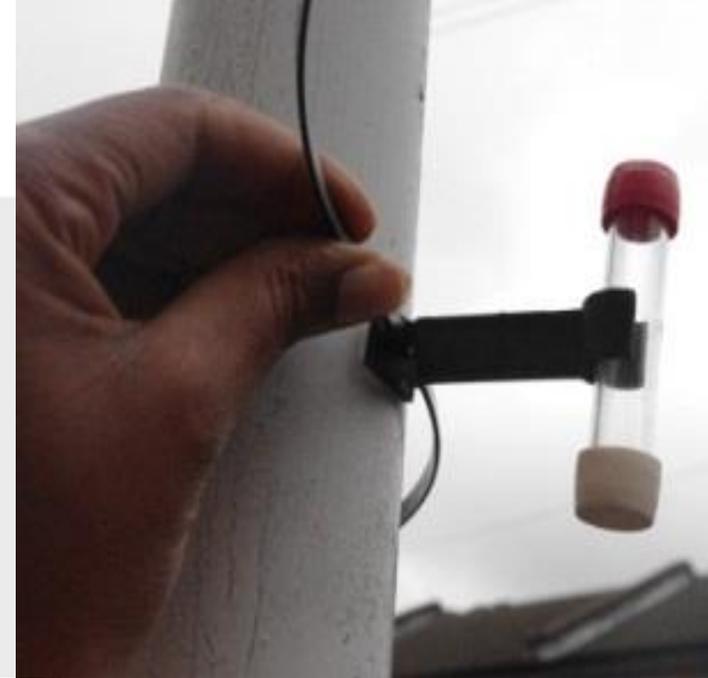


- Early warning system (~30 Volunteers)
- Visual observations, Ash collection, Equipment maintenance
- Communicate information from scientists → community
- Organise community response



Air Quality

Pollutant	Sampling Method
Nitrogen Dioxide	Diffusion tubes
Metal particles	Wipe samples



2008





Mapping for Change

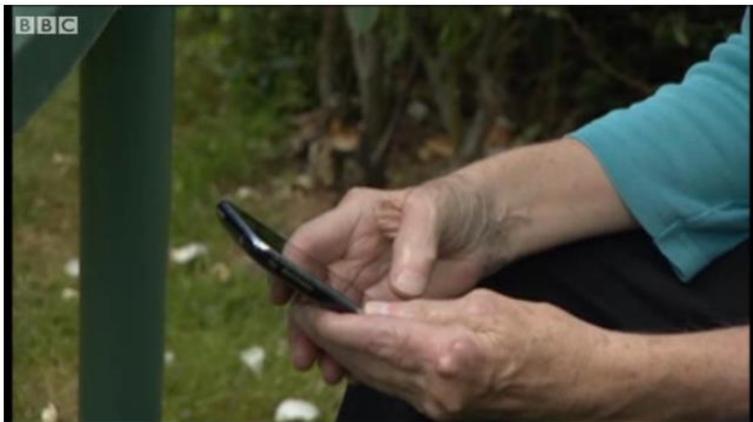
BBC News Sport Weather Capital Culture Autos TV Radio

NEWS LONDON

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Smartphone trial to capture Heathrow flight noise



Most watched

-
-
-

bbc.co.uk



19 June 2012 Last updated at 18:10 GMT

Residents living under the Heathrow flightpath in west London are being asked to take part in a trial to record the level of aircraft noise using smartphone technology.

The research is being carried out by University College London (UCL).

BBC London's Gareth Furby has talked to Isleworth resident Maggie Thorburn, Joe Ryle and Christian Nold from UCL and John Stewart of Hacan, a campaign group against aircraft noise.



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Richmond News Vince Cable Mayor's Question Time Nostalgia Bulletin National News

Richmond and Twickenham Times » News »

NEWS

New app allows smartphone users to measure aircraft noise

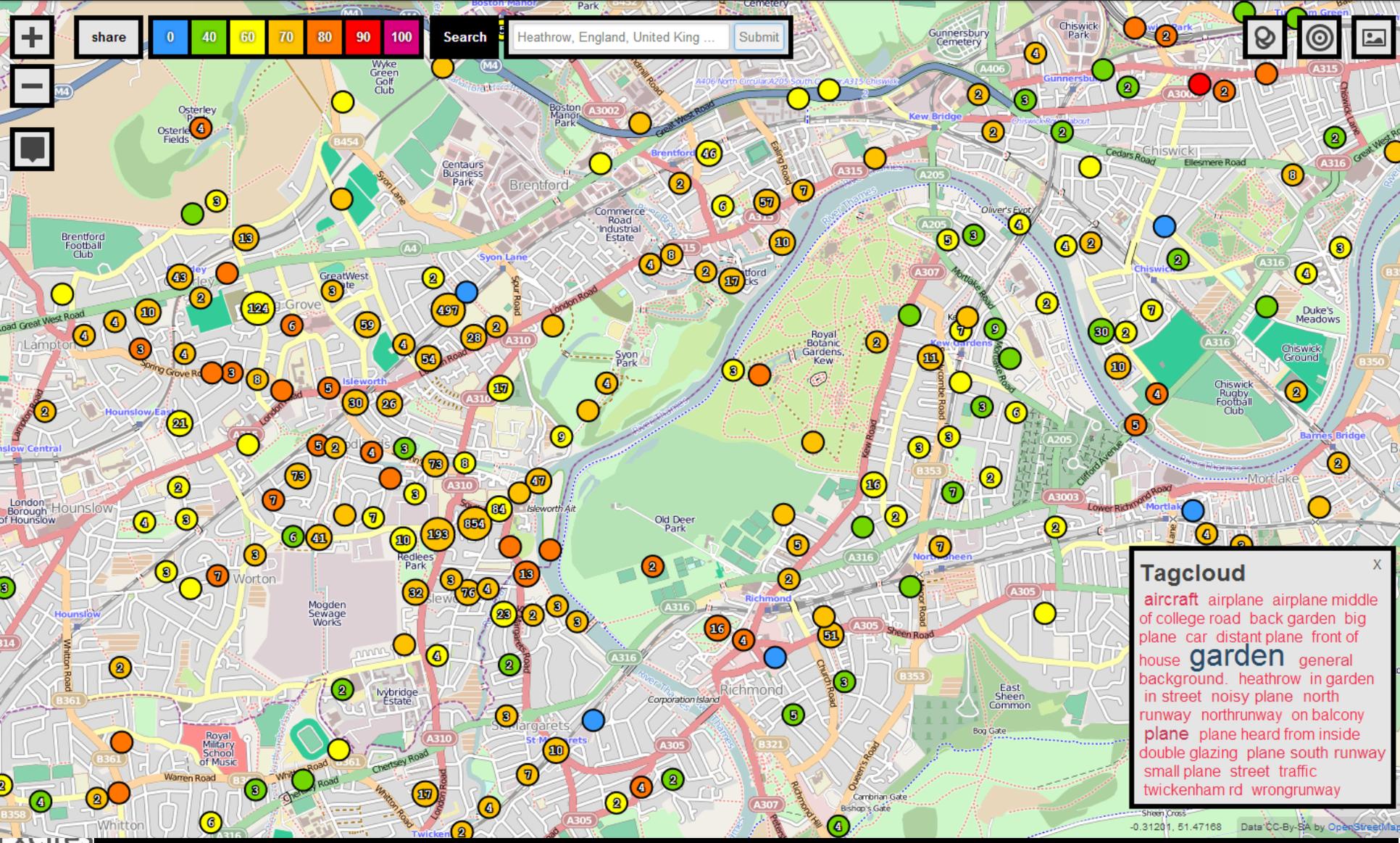
By Paul Teed

10:20am Thursday 28th June 2012 in News



Ears to the skies: Smartphones will be able to pick up noise levels overhead

Smartphone users will be able to measure the noise of planes flying overhead thanks to new technology.



Tagcloud

aircraft airplane airplane middle of college road back garden big plane car distant plane front of house **garden** general background. heathrow in garden in street noisy plane north runway northrunway on balcony plane plane heard from inside double glazing plane south runway small plane street traffic twickenham rd wrongrunway





Typology of Citizen Science



- **Contributory projects**, designed by scientists and members of the public primarily contribute data
- **Collaborative projects**, designed by scientists and members of the public contribute data but may help in project design, analysis, or dissemination
- **Co-created projects**, designed by scientists and members of the public working together and at least some of the public participants are actively involved in most/all steps of the scientific process

Participation in citizen science



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Level 4 'Extreme/
Up-Science'

- Collaborative science – problem definition, data collection and analysis

Level 3 'Participatory
science'

- Participation in problem definition and data collection

Level 2 'Distributed
intelligence'

- Citizens as basic interpreters

Level 1
'Crowdsourcing'

- Citizens as sensors

Data Quality Assurance



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- **Crowdsourcing** - the number of people that edited the information
- **Social** - gatekeepers and moderators
- **Geographic** - broader geographic knowledge
- **Domain knowledge** - the knowledge domain of the information
- **Instrumental observation** – technology based calibration
- **Process oriented** – following a procedure

Interoperability & reuse



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Every
U
Aware

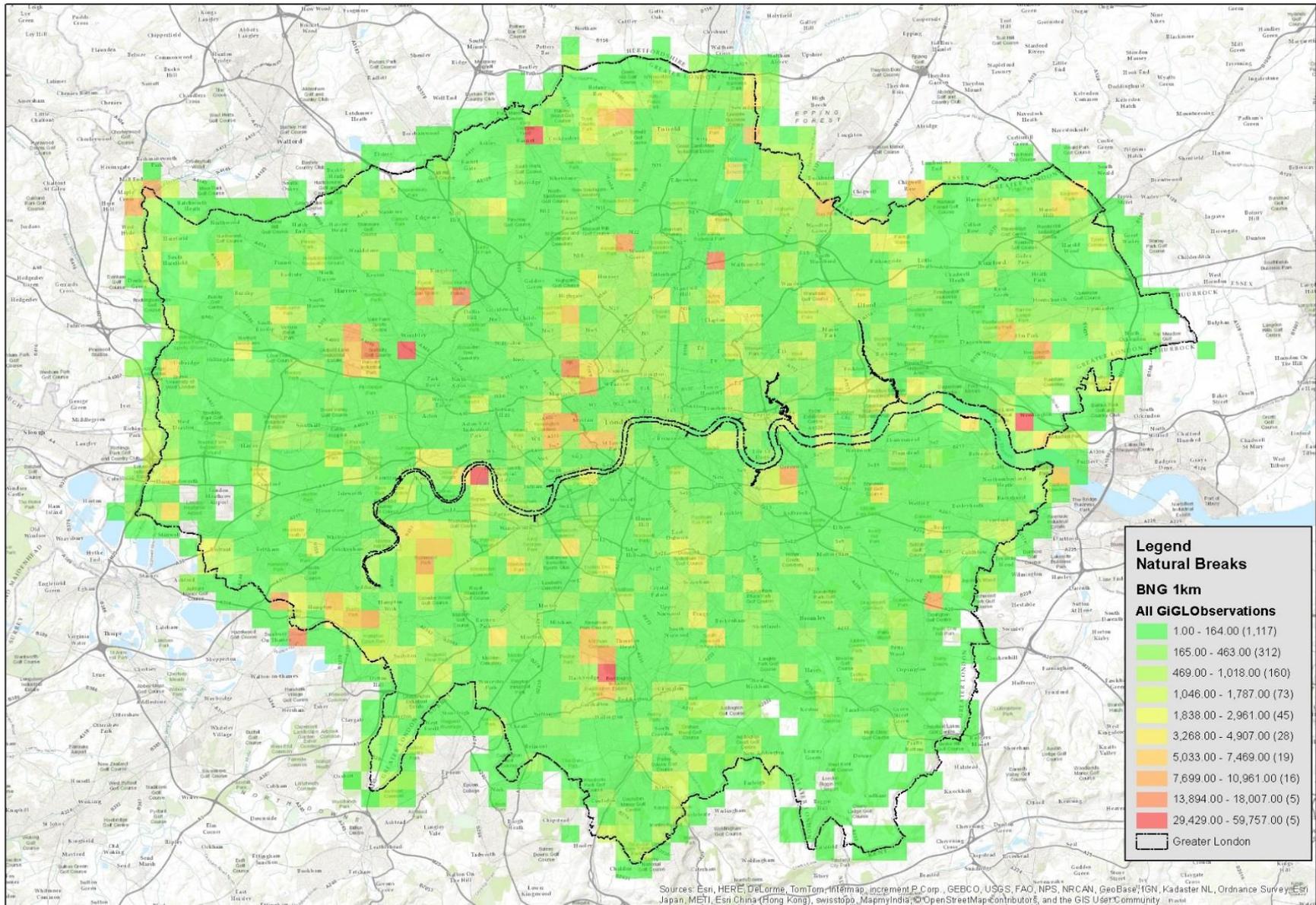


Mapping for Change

Privacy



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Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, ©OpenStreetMap contributors, and the GIS User Community

Privacy: iSpot / iNaturalist

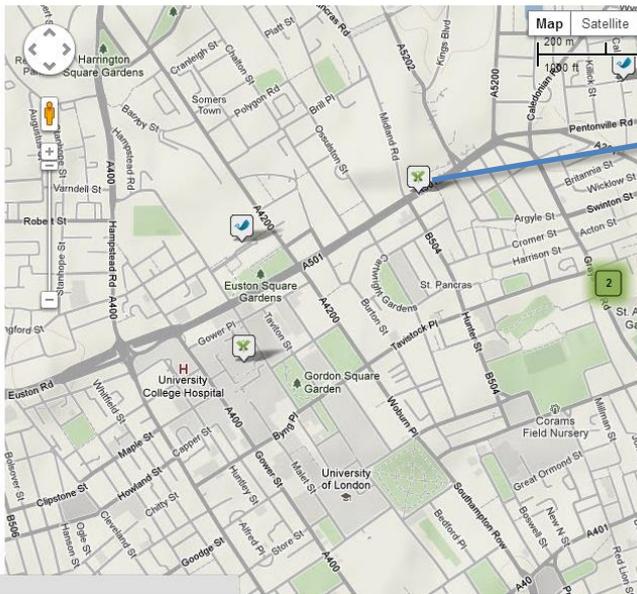


News Groups Forums Observations Keys In Your Area Help

Home

Observations Map [click here for help](#)

Go to a location using:
Address finder:



Observation filters

Showing 7 of 174104 observations

Show/hide all filters

Standard filters

Latest 100 for location

Filter by group

Filter by taxonomy

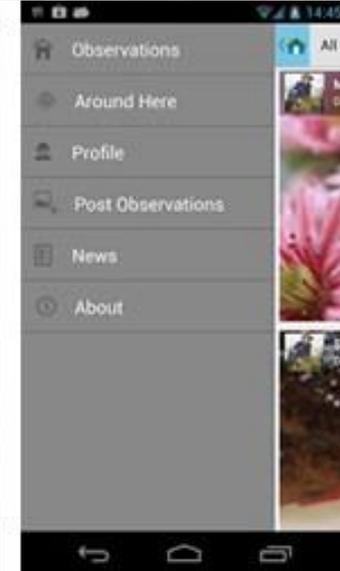
Filter by likely ID

Filter by date

Filter by habitat

Filter by tag

Search iSpot



Observation preview

Gold Bug



By: Rif
Location: St Pancras International (Stop A), London
Observed on: 20th October 2010
Added to iSpot: 20th November 2012
Likely ID: Rosemary Beetle (*Chrysolina americana*)
Identifications: 1
Agreements: 4
Comments: 0
Description: I was in the grounds of the British Library and this bug settled on my pannier. I wasn't sure what to do with it, so just flicked it off as it was reluctant to leave. It has puzzled me every since - has anyone seen something like this before? What is it called?



Find iSpot at <http://www.ispotnature.org/>



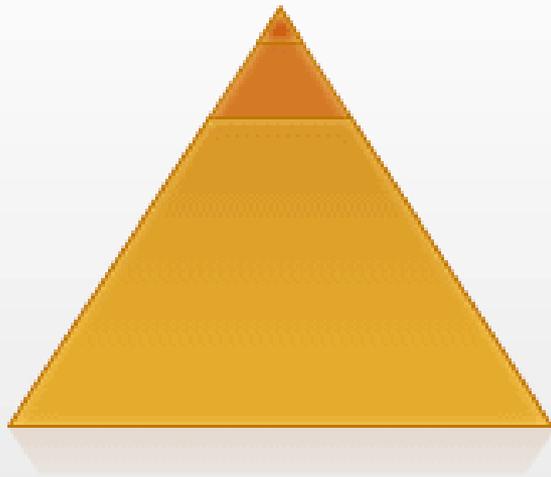
Motivation and engagement

- **Reasons to engage:** project goals, payment, benefits (tell friends), fun, easy to do, little effort.
- Sometime no need to ask user – passive crowdsourcing is based on sensors' information without active user engagement (mobile phones, TomTom)
- **Costs of engagement:** time, equipment, learning

Participation Inequality

90-9-1 Ratio

All large-scale, multi-user communities, social networks



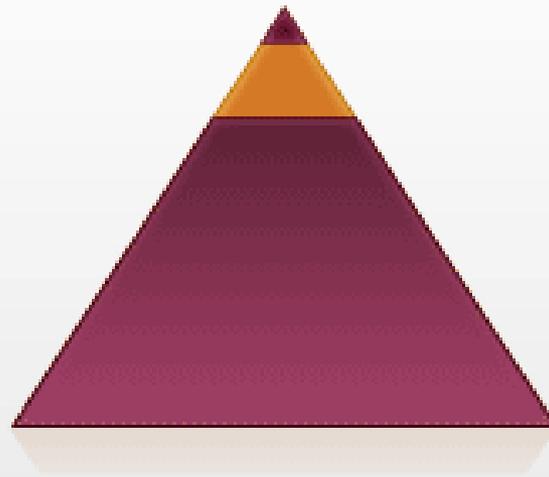
1% Heavy Contributors

9% Occasional Contributors

90% Lurkers

95-5-0.1 Ratio

Weblog Users



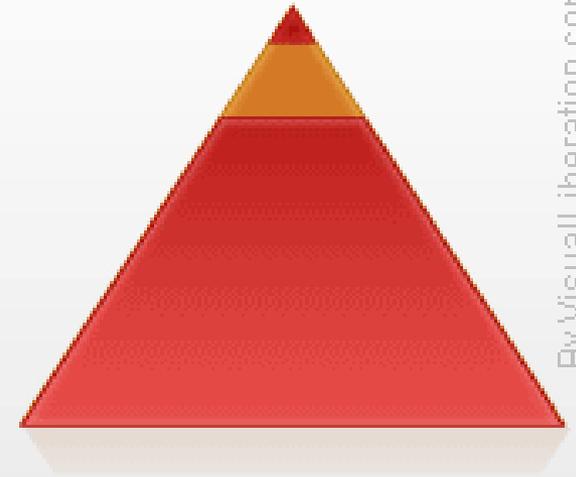
0.1% Heavy Contributors

5% Occasional Contributors

95% Lurkers

99.8-0.2-0.0003 Ratio

Wikipedia Users



0.0003% Heavy Contributors

0.2% Occasional Contributors

99.8% Lurkers

By VisualLiberation.com

Dimensions of VGI/Citizen

Science



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- **Purpose** : non-geographic, geographically implicit, geographically explicit
- **Geographical scale**: small (local, few participants) to large (global, many thousands)
- **Temporal scale**: short (from 30 min to few weeks) to ongoing, long term
- **Form of engagement**: passive, 'citizen as sensor', engagement in basic operation, engagement in design

Summary



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- Citizen-produced environmental information is on the rise and will continue to increase
- Characteristics – heterogeneous, temporal & spatial variability, multiple sources
- Different procedures, organisational structure and practices that demand consideration of data management and curation

case
study
series
vol 4

Citizen Science and Policy: A European Perspective

by Muki Haklay

W | Wilson Center COMMONS LAB

CROWDSOURCED GEOGRAPHIC INFORMATION USE IN GOVERNMENT

A report prepared for the World Bank
Global Facility for Disaster Reduction and Recovery



THE WORLD BANK



GFDRR

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Credits



Support for the research kindly provided by:

UCL Graduate School Research Fund

ESRC 'Conserving Biodiversity That Matters: The Value of Brownfield Sites' project

RGS/IBG Small Research Grant

UrbanBuzz: Building Sustainable Communities (HEFCE)

London Sustainability Exchange (LSx)

London 21 Sustainability Network

EPSRC Challenging Engineering Award 'Extreme Citizen Science'

EPSRC Adaptable Suburbs project

EU FP7 EveryAware project

Google Research Awards

Amazon Web Services Education Grants

Our special thanks to the participants and the communities that work with us

And to our partners: Royal Geographical Society, ESRI, Helveta and U-Blox