

HamSCI Campaign Co-Design

HamSCI 2021 Workshop

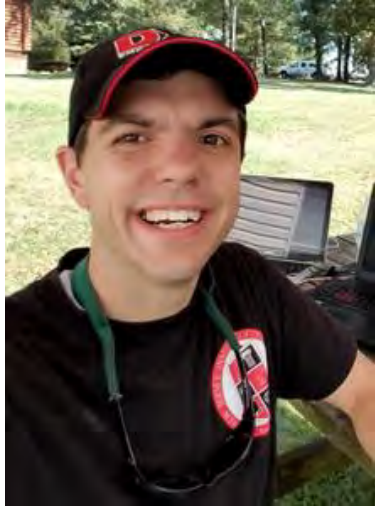
19-20 March 2021

Our Goals for Today

- Summarize past HamSCI events in context of **new definitions of citizen science**
- Show how **co-design campaigns** can sustain publishable science and foster radiosport events under the HamSCI banner
- **Design an experiment together and organize a volunteer team to run that experiment**

Thanks for joining!

Panelists



W2NAF

Nathaniel
Frissell



W1PJE

Phil
Erickson



KC3QGP

Laura
Brandt



KJ7RUB

Elizabeth
MacDonald



W9MDB

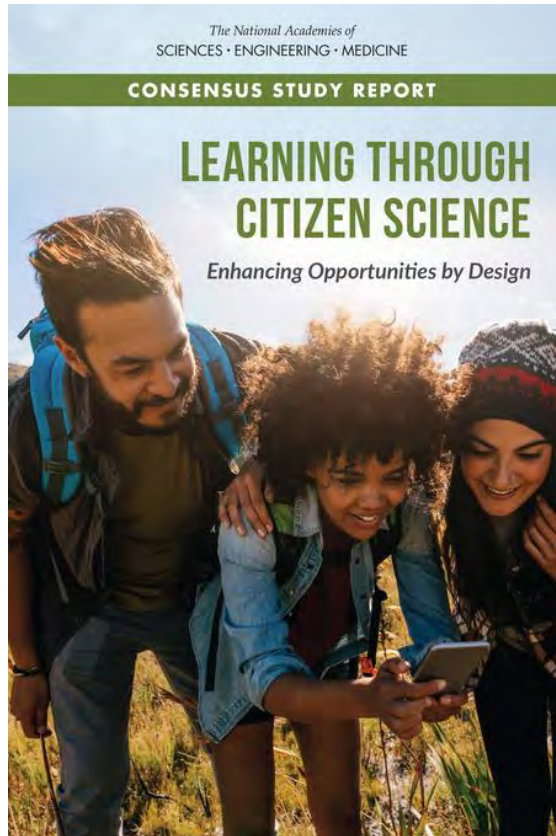
Michael
Black



KD2SAK

Gareth
Perry

What is *(not)* citizen science?



“Citizen science projects are those that typically involve nonscientists (i.e., people who are not professionally trained in project-relevant disciplines) in the processes, methods, and standards of research, with the intended goal of advancing scientific knowledge or application.” – NAS, 2018

Merely crowdsourcing data collection is not enough.

Ham Radio Forms a Planet-Sized Space Weather Sensor Network

For researchers who monitor the effects of solar activity on Earth’s atmosphere, telecommunications, and electrical utilities, amateur radio signals a golden age of crowdsourced science.



Equipment belonging to the Case Western Reserve University amateur radio club is seen here. Solar-induced effects in Earth’s ionosphere change the frequencies of radio signals picked up at receiving stations around the world, so ham radio enthusiasts can provide a rich source of information on space weather. Credit: Kristina Collins

By Kristina Collins, David Kazdan, and Nathaniel A. Frissell © 9 February 2021

Space weather events, triggered by solar emissions and their interactions with Earth’s atmosphere, can have significant effects on communications and navigation technology and on electric power systems. As with terrestrial weather events, the economic impacts of space

What is co-design?

Contributory

Scientists design the experiment, volunteers collect the data

Collaborative

Volunteers collect data, offer feedback on experiment design

Co-Designed

Volunteers are involved with experiment design from the beginning of the process.

What is a campaign?

“Data is a precious thing and will last longer than the systems themselves.”

–Tim Berners-Lee

A **science campaign** is a short-term organized effort to collect scientific data in a period of time, often to capture information about a **specific phenomenon** or event.

What is contesting?

“Talking to as many people as possible, as quickly as possible, about as little as possible.”

–KJ4HNN, others

Radiosport is an umbrella term that encompasses **radio contesting**, **radio direction-finding**, and other events.

Event Rules

Gamification: Contest rules are structured to encourage certain objectives.

How can we use these tools for science campaigns?

Contest/Event	Focus	Rule Example
Field Day	Newbie involvement, emergency preparedness, emergency communications	100 point safety checklist – fire extinguisher, radiograms
School Club Round-Up	Encourage school club involvement	School club multiplier – talking to schools gives vastly more points than talking to individuals
Frequency Measuring Test	Precision frequency estimation	Green box

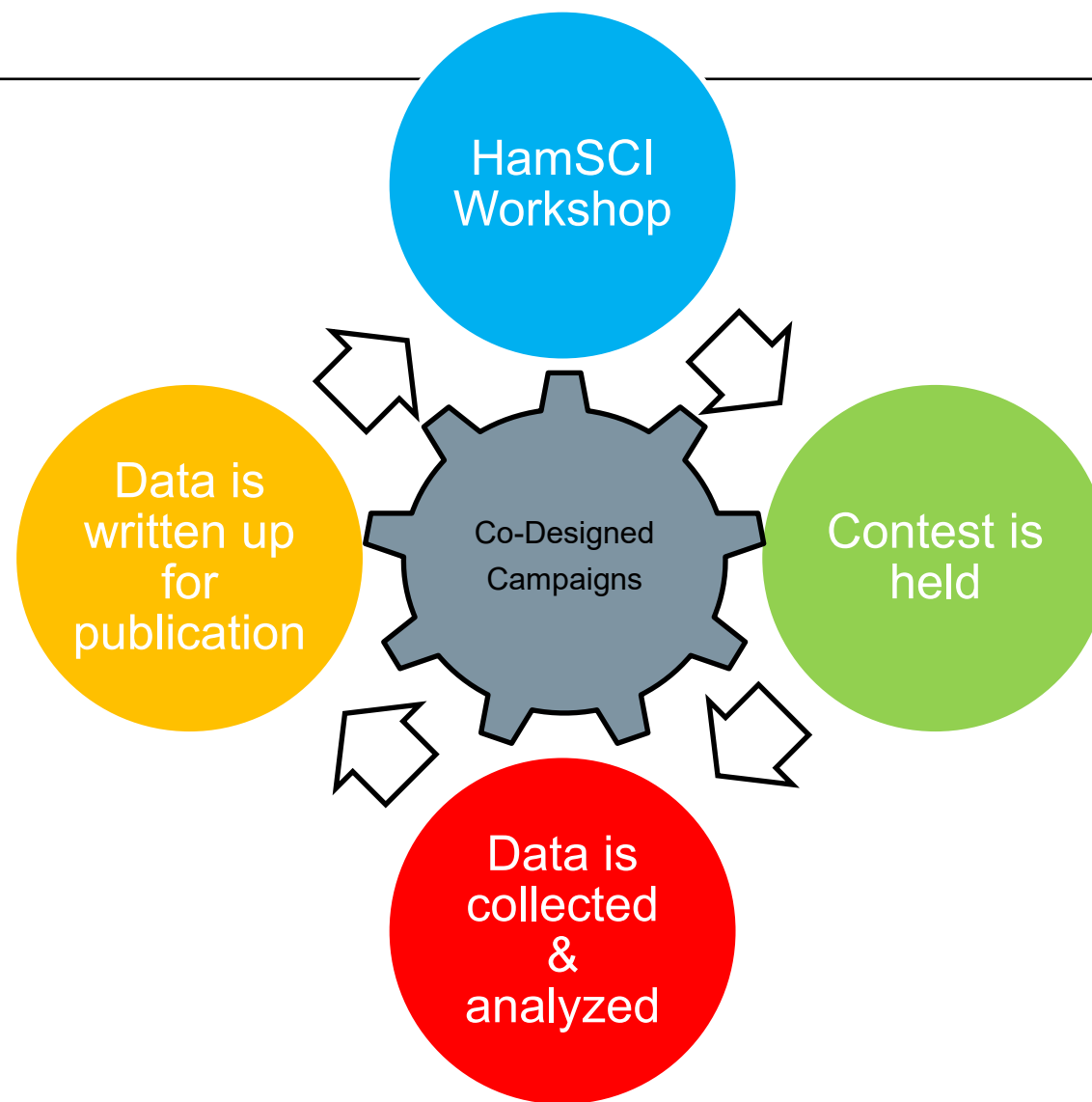
HamSCI Events Past



Campaign	Primary Activity	Required Adjustment/ Specialization ?	Feedback from hams to experimenter during experiment?	Peer-reviewed publication?	QSL Card?	Point System
Solar Eclipse QSO Party	Transmitting	No - normal operations	No	Yes	?	Yes
Festivals of Frequency Measurement	Listening	Yes - unusual tools	Yes	Yes	In progress	No
Golden Ears Project	Listening	Yes - specialized knowledge	Yes	<u>Yes</u>	No	No

Annual Progression

- Each year, a new campaign is developed with input at the HamSCI workshop as results from the previous year's campaign are disseminated
- Campaign is in line with that year's theme – changes year to year
- **Amateur Community:**
 - build competency, vie for points in the short & long term
- **Scientific Community:**
 - Annual campaigns generate regular publications
 - Platform for experiments with rapid deployment and feedback



Campaign Leaders – Seeking Volunteers

Scientist



Propose experiment

Drive experiment design

Verify protocols

Manage data, publications

Communicate with participants

Coauthor publications

Ham



Compile contest rules

Maintain campaign webpage

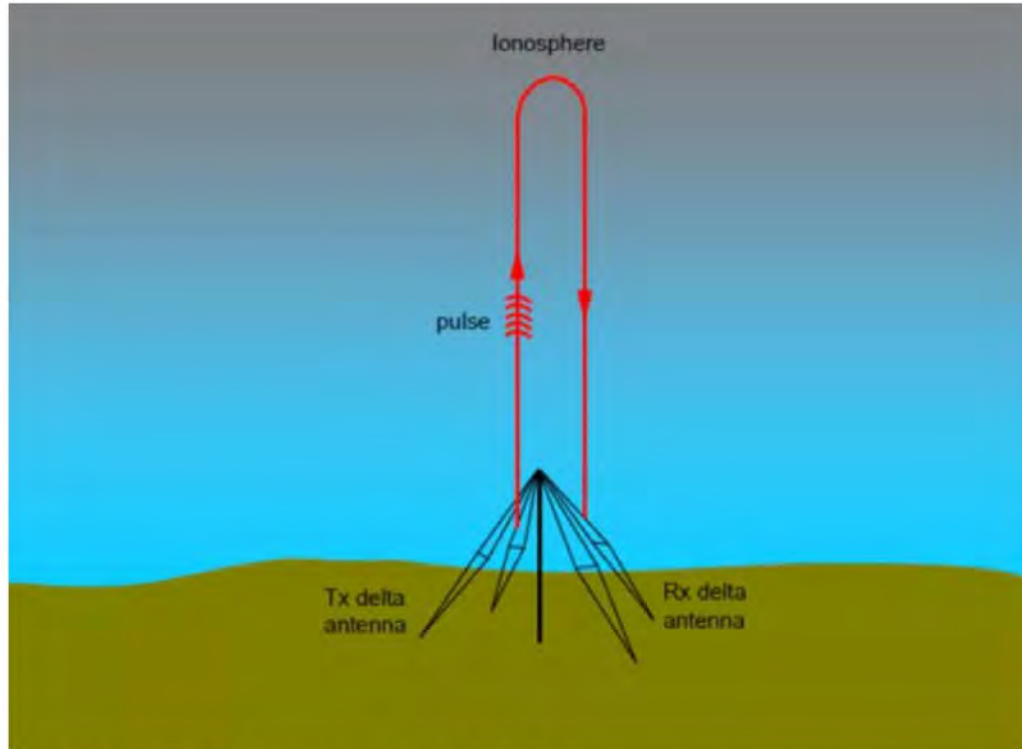
Publicize event

Send out awards, certificates

Criteria for Success

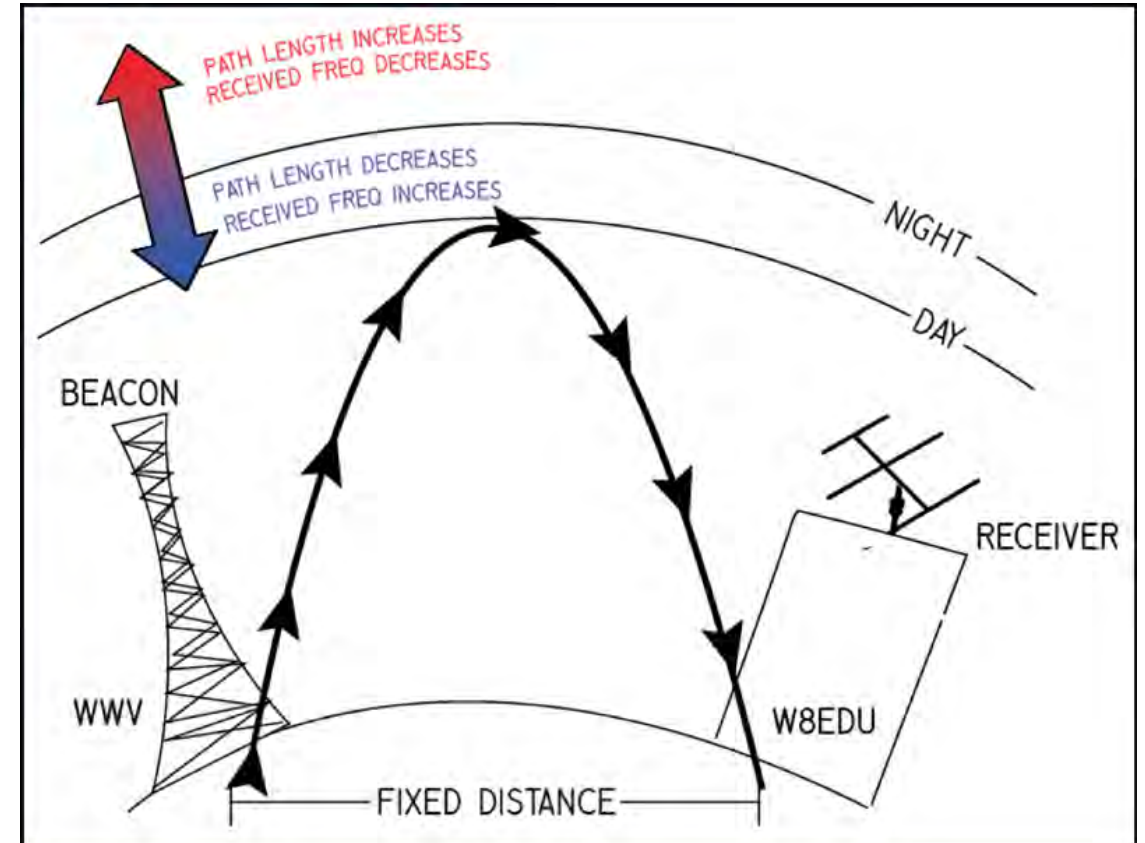
- **Autonomous** (organized)
- **Require operators to use the practice – not just the tools – of amateur radio** (fun)
- **Rigorous, publication-oriented** (organized fun)

Ionosondes



A BASIC SCHEMATIC OF AN IONOSONDE *Australian Bureau of Meteorology*

Frequency Meas. Test



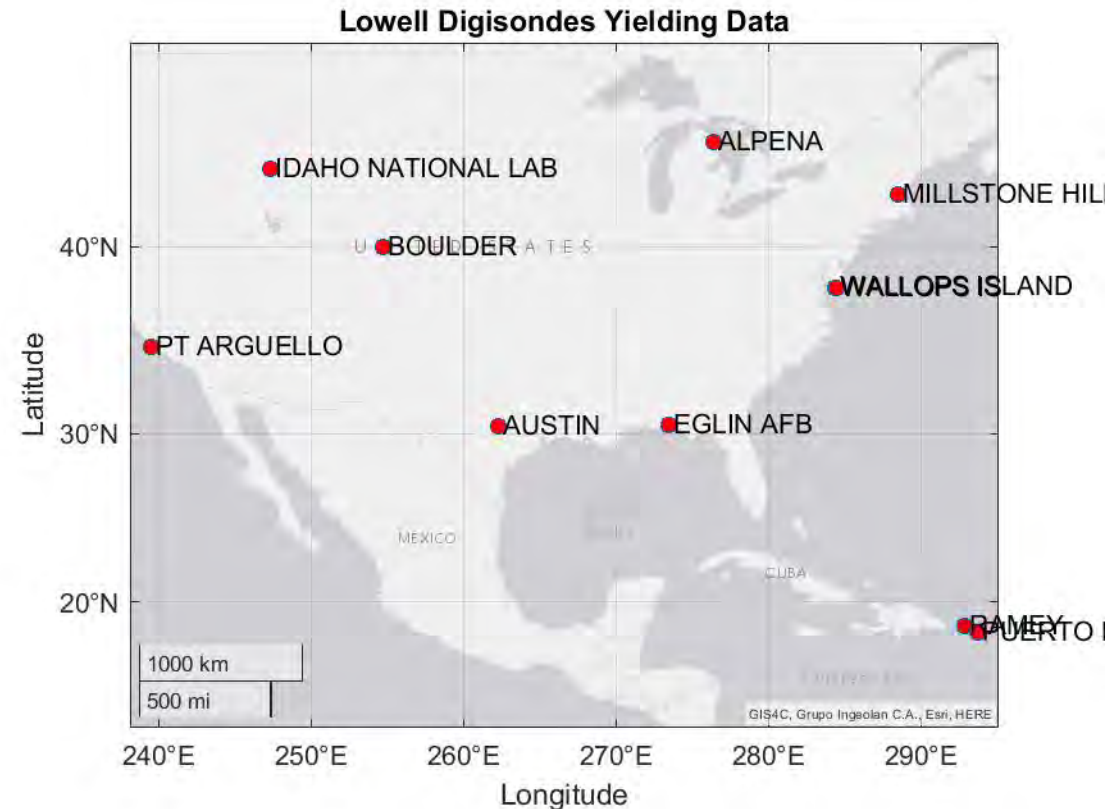
<http://fmt.arrl.org/>

Research Questions

- The FFM approach gives us relative motion of ionospheric height; ionosondes can give us ground truth.
- How can we separate out the effects of shifting ionospheric height vs. refraction on Doppler measurements?
- Per Steve WA5FRF's slides, precision frequency estimation is necessary on both sides of the contact

Experiment Design

- Lowell digisondes
- **Find a station on the opposite side of a digisonde**
 - Ideal distance – 1000-1500 km?
- Frequency Measuring Test approach, Festival of Frequency Measurement objective
- Morning transition



Discussion Format

- Agenda:
 - 20 mins on science questions
 - 20 mins on radiosport questions
 - Conclusion – convene team leads
- Use the chat and Q&A! Please add detailed notes.
- We don't expect to answer these questions completely today
- Add thoughts (and sign up) at hamsci.org/codesign

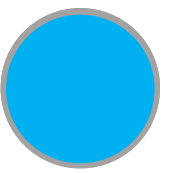
Discussion Questions

- What science questions can we apply this approach to?
- What's the ideal arrangement of transmitters and receivers relative to an ionosonde?
- What investigations do we want to encourage?

- How can we structure this as a radiosport event?
- How can we make this competitive?

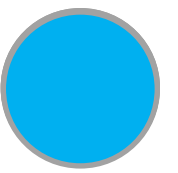
- Who will act as our team leads?
- What should we call the event?

Research Questions



- What science questions can we apply this approach to?
- What's the ideal arrangement of transmitters and receivers relative to an ionosonde?
- What investigations do we want to encourage among volunteers?
- What dataset would you want to have at the end of this?

Radiosport Questions

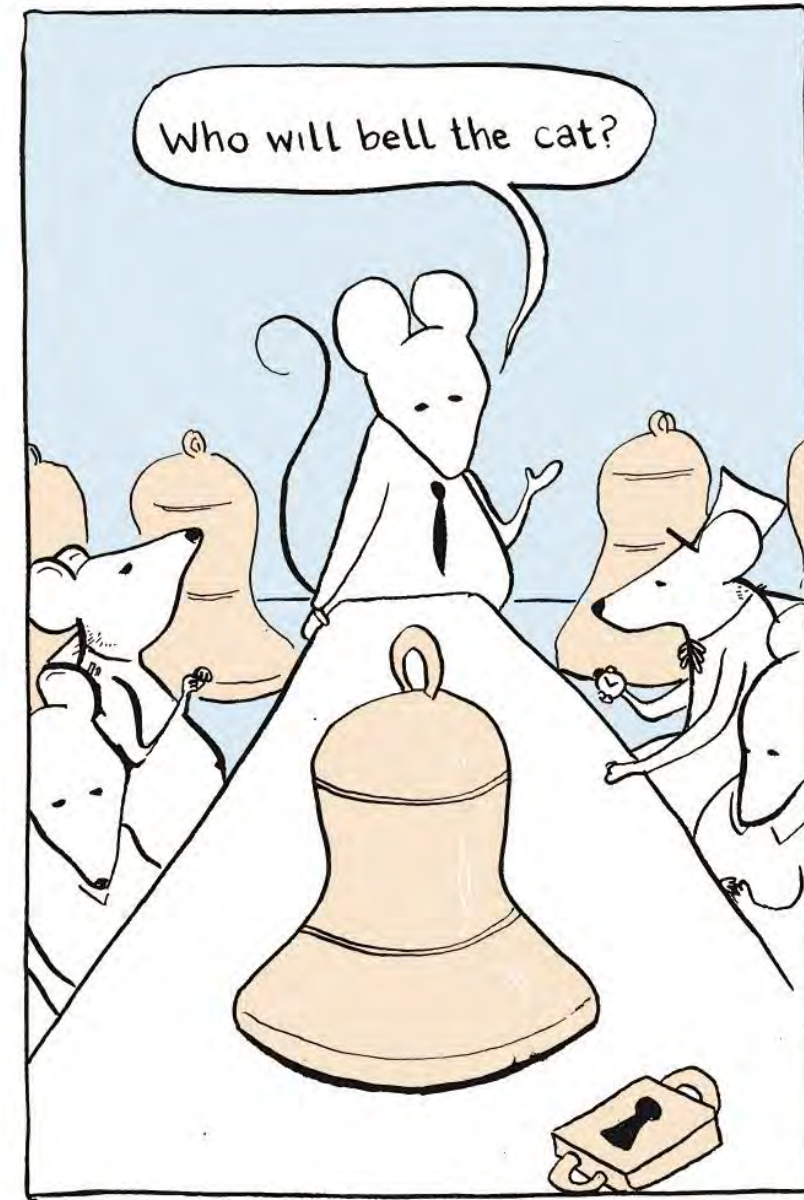


- How can we structure this as a contest/radiosport event?
- How long should the event last?
- What should we call this event?

Team

If you are willing to volunteer to coordinate this experiment, please say so in the chat.

You can join the mailing list at https://groups.google.com/g/hamsci_co-design.



Excerpted from <https://dannott.com/portfolio/belling-the-cat/>