



Engaging Communities in Environmental Research: The Power of Citizen Science

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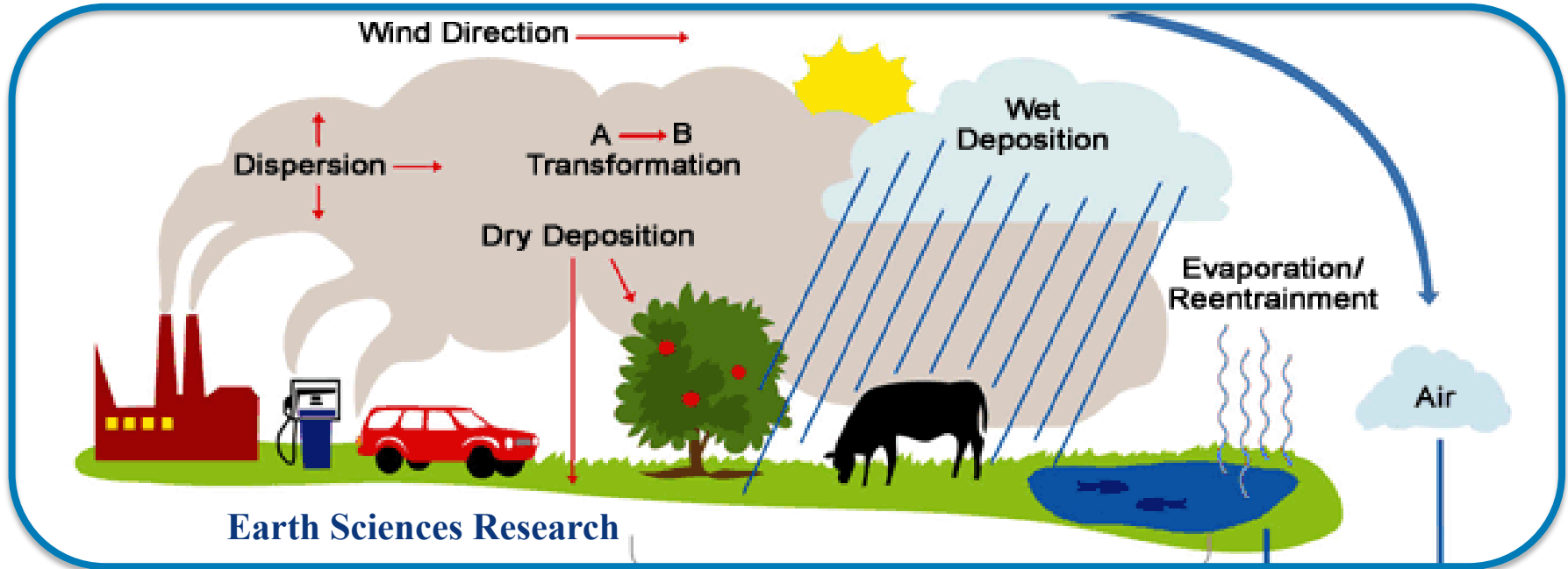
Interim Chair, Department of Preventive Medicine and Environmental Health

College of Public Health

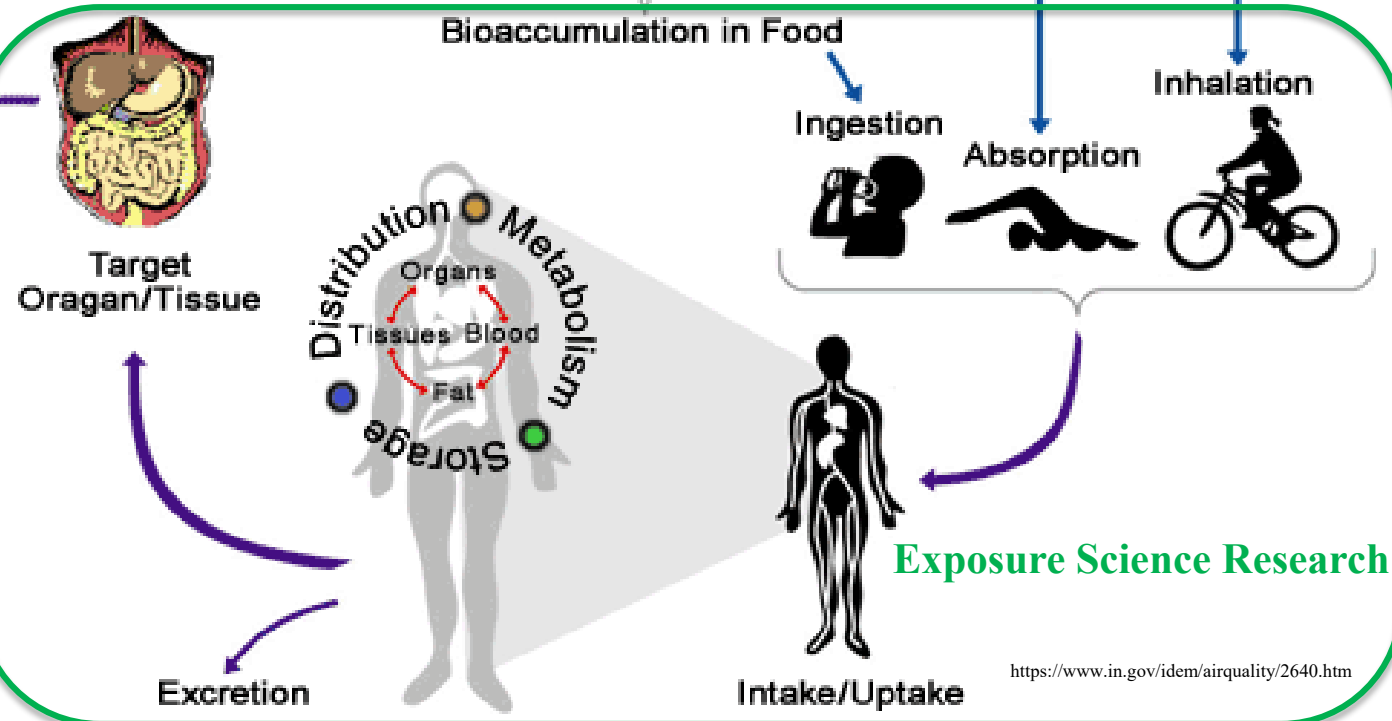
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Kentucky Geological Survey 58th Annual Seminar

May 17, 2019



- HEALTH EFFECTS**
- Reproductive effects
 - Respiratory effects
 - Neurological effects
 - Birth defects
 - Cancer
 - Other effects





Environmental Epidemiology



Exposure



Biomarkers of Exposure



Health





Exposome

Lifetime exposures



- Air quality
- Industrial chemicals
- Pesticides
- Radiation
- Food and water
- Tobacco
- Medications
- Physical activity
- Climate
- Psychological stress
- Urban environment
- Social support etc.

Exposome pharmacokinetics-pharmacodynamics

Pharmacokinetics



Internal dose

Pharmacodynamics



Epigenome



Transcriptome



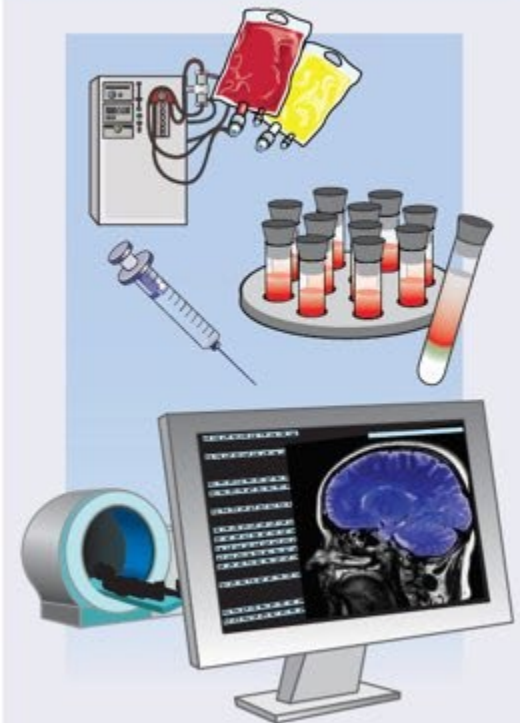
Proteome



Metabolome

Biological response

Health phenotypes



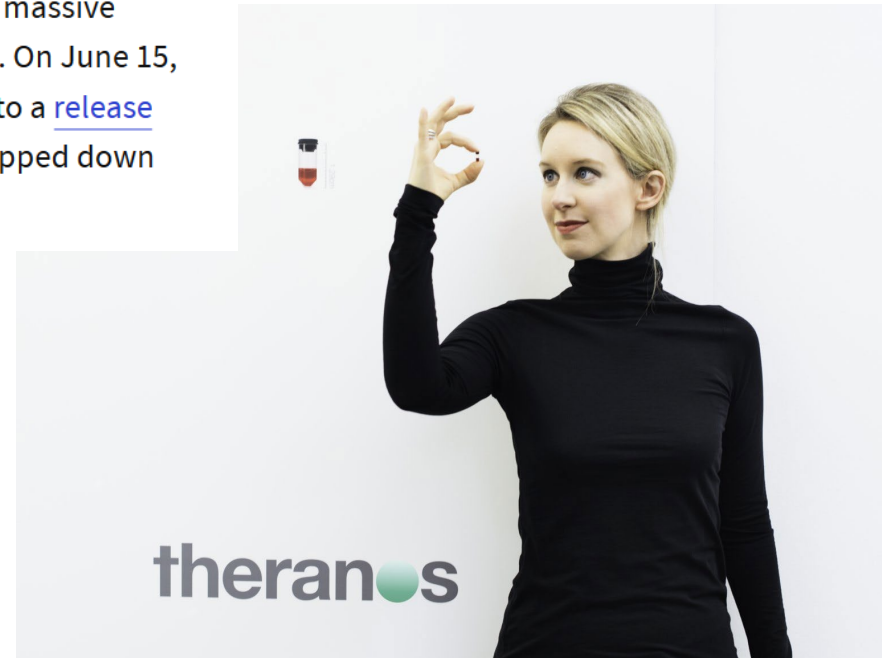
<https://twitter.com/exposome/status/1044588169600094208/photo/1> and humanexposomeproject.com

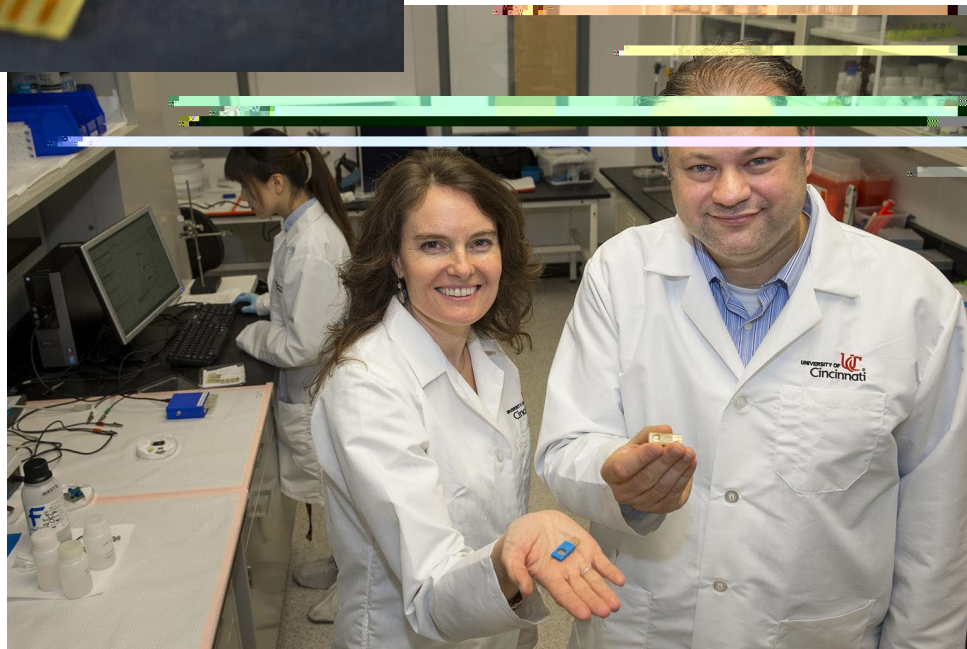
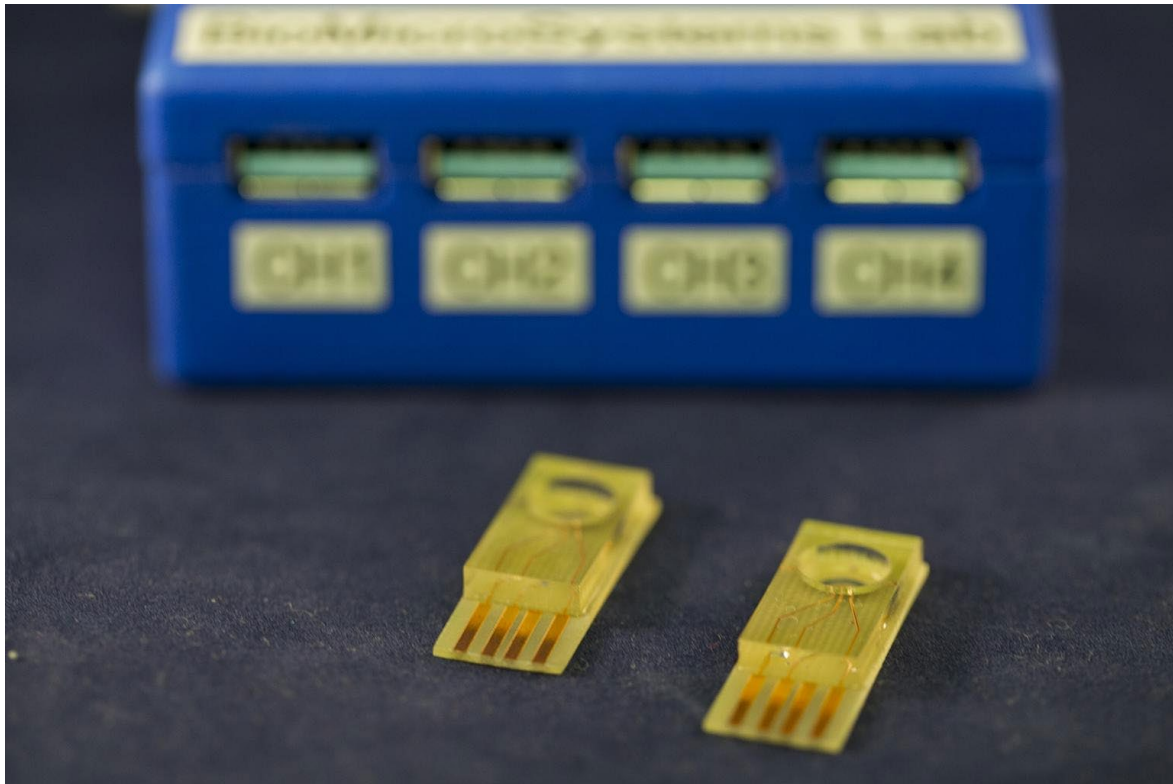
Theranos: A Fallen Unicorn



BY [ZAW THIHA TUN](#) | Updated May 15, 2019

Theranos Inc., a consumer healthcare technology startup, was once valued at \$10 billion, and its leadership claimed it would revolutionize the blood testing industry. However, the technological breakthrough that [CEO](#) Elizabeth Holmes and former company president Ramesh Balwani touted was never demonstrated, and the assertions of Holmes and Balwani amounted to outright deceit. Holmes and Balwani were ultimately charged by the SEC for massive fraud. The two executives agreed to settle subject to court approval. On June 15, 2018, Holmes and Balwani were charged with wire fraud according to a [release](#) by the U.S. Attorney's Office, North District of California. Holmes stepped down as the CEO of the company on the same day.







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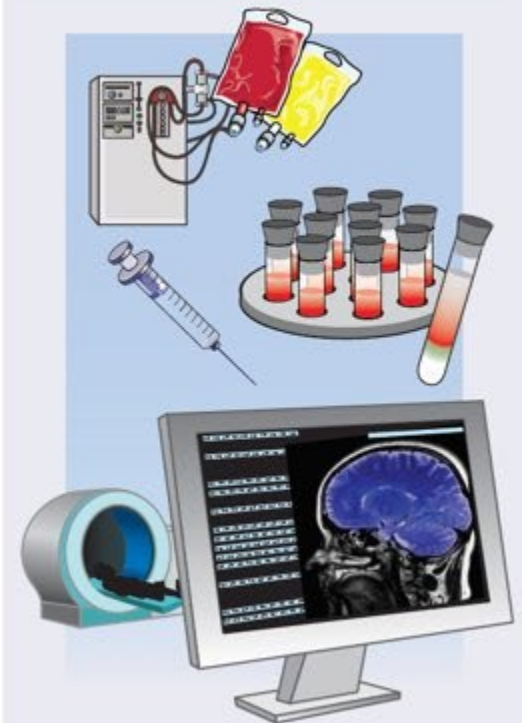
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<https://twitter.com/exposome/status/1044588169600094208/photo/1> and humanexposomeproject.com

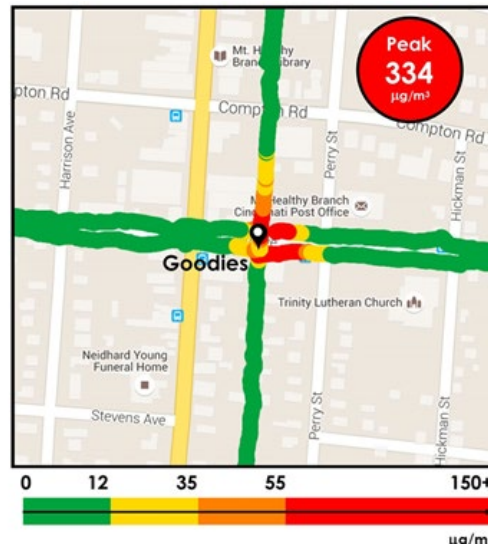
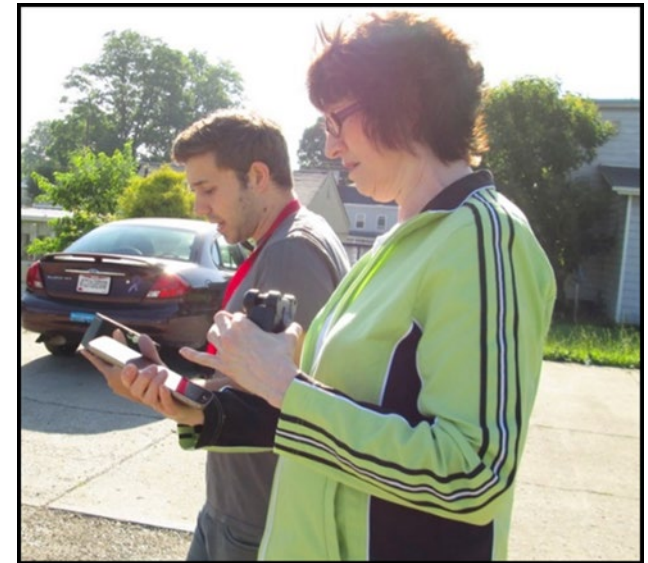


Public Participation in Water Quality Assessment





Public Participation in Air Quality Research





Citizen science is the public involvement in inquiry and discovery of new scientific knowledge.

- 1) Participants use the same protocol
- 2) Data are useful for scientific research
- 3) Collaborative between scientists and volunteers
- 4) Data are accessible



over 1K

Projects

over 1M

Volunteers



























over 5K

Members



Federal Crowdsourcing and Citizen Science Catalog

Number of Projects: 439

	Regional Air Sensor Loan Program...	Marine/Water Contact Sanitary Survey Workshops...	Cyanoscope – EPA collaborative partnership...	Using Citizen Science to Analyze...	Micro CSI – Urban Edition...	Community-led Air Sensor Evaluation in...	The effica science...
<p>Puerto Rico</p> <p>+</p> <p>+</p> <p>+</p>	<p>Status: volunteers Geographic Scope: Check your local Regional EPA office -...</p> 	<p>Status: recruiting volunteers Geographic Scope: California- in Riverside County, Los Angeles County,...</p> 	<p>Status: volunteers Geographic Scope: National</p> 	<p>Status: volunteers Geographic Scope: National participation, video & photographs from Great...</p> 	<p>Status: recruiting volunteers Geographic Scope: Atlanta and Athens, Georgia</p> 	<p>Status: recruiting volunteers Geographic Scope: North Carolina</p> 	
<p>zen</p> <p>uiting</p> <p>southwest and Oregon</p>	<p>Air Sensor Toolbox</p> <p>Status: Complete - not recruiting volunteers Geographic Scope: National</p> 	<p>Using Citizen Science to Improve...</p> <p>Status: Active - not recruiting volunteers Geographic Scope: Puerto Rico</p> 	<p>Biodiversity discovery and phenology in...</p> <p>Status: Active - recruiting volunteers Geographic Scope: Acadia National Park and Downeast Maine</p> 	<p>Hawaii Bottomfish Heritage Project -...</p> <p>Status: Active - not recruiting volunteers Geographic Scope: Hawaii</p> 	<p>Crowdsourced Bathymetry</p> <p>Status: Active - recruiting volunteers Geographic Scope: Worldwide</p> 	<p>Cooperative research provides new data...</p> <p>Status: Active - recruiting volunteers Geographic Scope: Puget Sound, WA</p> 	
<p>uiting</p>	<p>Landslide Reporter</p> <p>Status: Active - recruiting volunteers Geographic Scope: Global</p> 	<p>Steller Watch</p> <p>Status: Active - recruiting volunteers Geographic Scope: Aleutian Islands, Alaska</p> 	<p>Democratization of Measurement and Modeling...</p> <p>Status: Active - not recruiting volunteers Geographic Scope: Pittsburgh, Pennsylvania</p> 	<p>The Hawaii Island Volcanic Smog...</p> <p>Status: Active - not recruiting volunteers Geographic Scope: Hawaii</p> 	<p>Hui o ka Wai Ola...</p> <p>Status: Active - recruiting volunteers Geographic Scope: Maui, Hawaiian islands</p>  	<p>SMART (Stormwater Management Research Team):...</p> <p>Status: Active - recruiting volunteers Geographic Scope: Maine, New York, North Carolina, Florida, Alabama,...</p> 	
<p>uiting</p> <p>Charlotte, Carolina</p>	<p>Building Resiliency in California's Central...</p> <p>Status: Active - not recruiting volunteers Geographic Scope: Regional (California's Central Valley)</p> 	<p>Shared Air/Shared Action (Saz): Community...</p> <p>Status: Active - recruiting volunteers Geographic Scope: Chicago, Illinois</p> 	<p>Arizona Water Watch</p> <p>Status: Active - not recruiting volunteers Geographic Scope: The state of Arizona</p> 	<p>Smoke Sense</p> <p>Status: Active - recruiting volunteers Geographic Scope: national</p> 	<p>Gardenroots: A Citizen Science Garden...</p> <p>Status: Active - recruiting volunteers Geographic Scope: All US, specifically AZ</p>  	<p>Monitoring the Air in Our...</p> <p>Status: Active - not recruiting volunteers Geographic Scope: Denver, Colorado</p> 	



WELCOME TO THE ZOOVERSE
People-powered research

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- [CLIMATE](#)
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- [MEDICINE](#)
- [NAT](#)

Most Recently Launched

Showing 1-18 of 18 projects found.

Name:

MUON HUNTERS 2.0

COSMIC

LOCAL GROUP CLUSTER SEARCH

PLANET HUNTERS TESS

SUPERWASP VARIABLE STARS

VARIABLE STAR ZOO

SPACE WARPS - HSC

GALAXY ZOO

SOLAR STORMWATCH II

EXOPLANET EXPLORERS

ASTRONOMY REWIND

GALAXY ZOO: 3D

BACKYARD WORLDS: PLANET 9

PLANET FOUR: RIDGES

LIVINGSTON - O2a

GRAVITY SPY



FREE

The Appalachian VOICE

Dec. 2018 / Jan. 2019

ENERGY Democracy

Part Two of a two-part series looks at how everyday people are taking charge of their electricity systems and prioritizing clean energy, affordability and choice

ALSO INSIDE:
Citizen Science
Discover projects underway across the region and how you can get involved



Considerations of Data

- Valid, reproducible, accurate...high quality
- Accessible
- Devices selected based on fit for purpose
- Mechanisms for checking data quality
- Interpret-able results

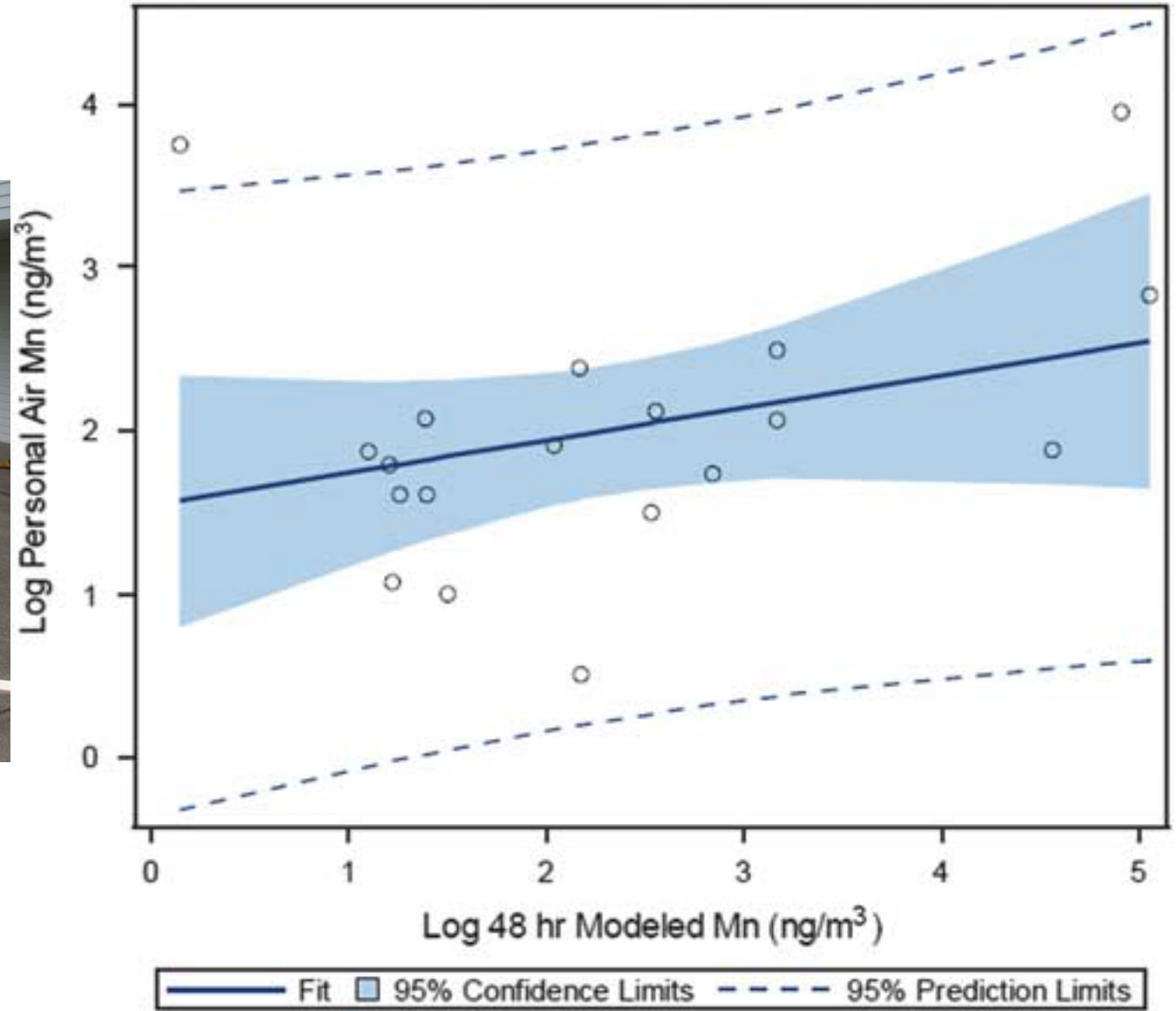


- Crowdsourcing can be powerful
 - Let's maximize this valuable data resource
 - Increase public participation in science
-
- Increase STEM in our communities
 - Increase environmental exposure research



Thank you!

Let's go collect data!



Regression plot of log personal air Mn with log AERMOD 48 h modeled air (N=19)



Pathways of inhalation exposure to manganese in children living near a ferromanganese refinery: A structural equation modeling approach

© Florence Fulk ^a, Paul Succop ^{b,†}, Timothy J Hilbert ^b, Caroline Beidler ^c, David Brown ^d,
Tiina Reponen ^b, Erin N Haynes ^{b,*}

Science of the Total Environment 579 (2017) 768–775

