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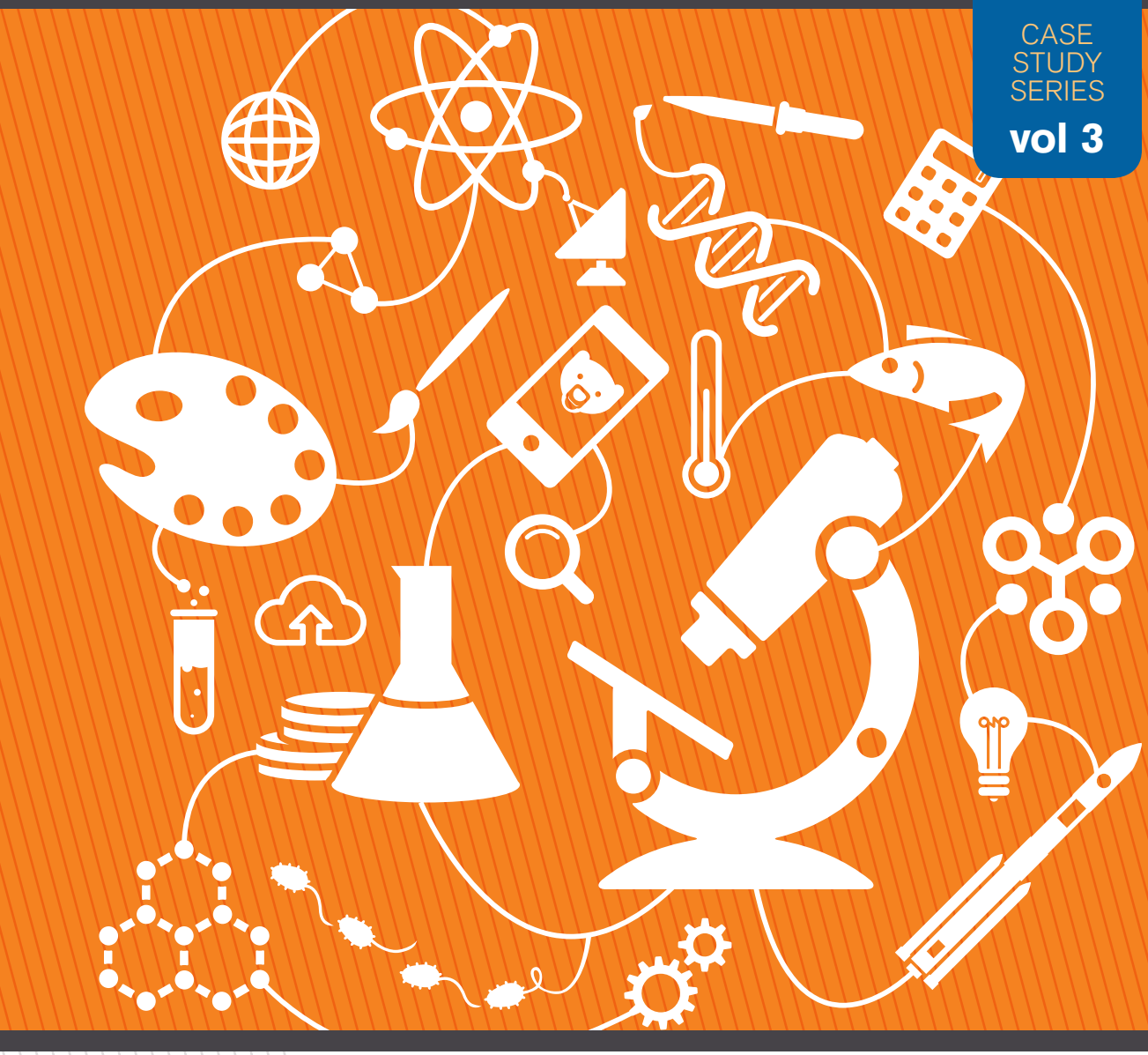

DC SCIENCE HACK DAY AT THE WILSON CENTER

BRIDGING THE HACKING COMMUNITY AND GOVERNMENT

ELIZABETH TYSON
ANNE BOWSER

Wilson Center
COMMONS LAB

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by Elizabeth Tyson,
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Anne Bowser,
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DC SCIENCE HACK DAY AT THE WILSON CENTER:
Bridging the Hacking Community and Government

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COMMONS LAB

The Commons Lab of STIP seeks to mobilize public participation and innovation in science, technology and policy.

http://CommonsLab.WilsonCenter.org

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About the Authors

Anne Bowser and Elizabeth Tyson are Program Associates with the Science and Technology Innovation Program (STIP). They co-direct the Commons Lab, a research project focused on mobilizing public participation and innovation in science, technology, and policy. Both review and edit Commons Lab publications such as Citizen Science and Policy: A European Perspective, Typology of Citizen Science from an Intellectual Property Perspective and Crowdsourcing, Citizen Science and the Law.

ELIZABETH TYSON

Elizabeth scouts and manages new collaborations and conducts original research exploring the uses of citizen science domestically and abroad for furthering environmental protection, civic participation, ecosystem services and diverse stakeholder collaboration and cooperation.

Elizabeth completed a dual-degree M.S. in the Human Dimensions of Natural Resources from Colorado State University and El Colegio de la Frontera Sur, Chiapas, Mexico, and a B.A. in Religious Studies and Environmental Studies from Guilford College in Greensboro, NC. Her thesis work studied the application of a mobile data collection system for community based natural resource monitoring and carbon accounting on coffee farms buffering El Triunfo Biosphere Reserve in the Sierra Madre, Chiapas. More information on this research can be found here: http://bit.ly/1MH2ZYs.

ANNE BOWSER

Anne's research focuses on understanding how technology can contribute to or mitigate important cross-cutting issues in citizen science. Her dissertation takes a cooperative research through design approach to designing Floracaching, a geocaching game for biodiversity data collection created to mobilize participation in university communities. Anne is also a principle investigator on an NSF-funded project to study location privacy in citizen science. Finally, she supports the international practice of citizen science as the co-founder of a data and metadata working group of the Citizen Science Association.

In addition, Anne contributes to a number of collaborative Wilson Center projects. She manages the development of The Commons Lab Inventory, a collection of federally supported citizen science and crowdsourcing projects. Anne also supports the Wilson Center's initiative on serious games.

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The Commons Lab of the Science and Technology Innovation Program at the Woodrow Wilson International Center for Scholars partnered with ArtsEdge from the John F. Kennedy Center for the Performing Arts to bring Science Hack Day to DC. Thompson Reuter's ENDNOTE is a sponsor of Science Hack Days around the world and provided support for DC Science Hack Day. Github, an online code repository, offered their services to participants during the weekend and a free, year-long membership for the winning teams. Ifixit, a do-it-yourself online resource, donated their software fixing toolkits and card game Cards Against Humanity, which was running a women in Science, Technology, Engineering and Mathematics (STEM) campaign, donated copies of the game as prizes. In addition, Ariel Waldman, founder of Science Hack Day, joined us to make the inaugural event an incredibly memorable one.

The Commons Lab would like to thank the generosity and logistical support from the internal staff at the Wilson Center, which agreed to host such a complicated event and helped make it incredibly successful. We would also like to thank Nuit Hansgen, Allen Brooks and Tiffany Bryant from ArtsEdge for their incredible support in brainstorming ideas, organizing pizza logistics, and coordinating film crews. Lastly, a big thank you to the staff and interns of the Science and Technology Innovation Program and the Commons Lab. We are a small but mighty team.

ARTSEDGE
DIGITAL LEARNING FROM
The Kennedy Center

Alfred P. Sloan
FOUNDATION

Commons
Lab

Media Resources

ArtsEdge film about Science Hack Day: http://bit.ly/SHDdcVideo
Wilson Center NOW interviews on Science Hack Day:
http://bit.ly/SHDdcNOWVideo
Tweets and photos from the event: http://bit.ly/SHDdcStorify

Open Participation Models for Policymaking, Government & Science

There *is* a growing desire in both the public and the government to interact on a higher and more meaningful level, and technology is enabling this to happen more frequently.[1]

Encouraging transparency and accountability initiatives and funding research that develops technology to enable these initiatives will be vital in creating an agile and participatory environment within big government. However to achieve this ideal participation model, both sides must keep the momentum and we will need more successful models and stricter guidelines on best practices for implementation.

Successful models of this are growing within the government. Led by the White House, The Open Government Plan (currently in its 3rd iteration) is an international initiative to drive participation and transparency in government facilitated through the aid of technology.[2] Its first iteration created opendata.gov, a repository of all federal datasets that are publically available in machine readable format. And the number of hackathons hosted by government agencies, the White House, and Congress is growing significantly as their utility is recognized in building civic participation and solving problems.[3]

In addition, there is growing research that demonstrates how the public can work with government to collect data, and help tackle complex issues and solve difficult problems. CoCoRaHS, a network of volunteers collecting precipitation data in their backyard, publishes to the National Weather Service, improving maps and granularity. Natures Notebook, by the USA National Phenology Network, invites observations from volunteers to track the seasonal flowering of plants across the nation. This year the White House implemented a CoCoRaHS rain gauge in their backyard in a demonstration of executive branch citizen science.[4]

Among other research initiatives, the U.S. government is investing in methods to capture the power and intelligence of the *crowd* with the Good Judgement Project. This

research initiative, among others, is a great example of smart investing for developing best practices surrounding open participation models, specifically *crowdsourcing*.

The Good Judgement Project is part of the Aggregative Contingent Estimation Program (ACE) sponsored by the U.S. Intelligence Advanced Research Projects Activity.[5] The goal of the project is to test the efficacy and accuracy of crowd (defined as a large group of random and anonymous participants) forecasting. Five university teams competed to see who could accurately forecast world events using the predictions of 2,000 people who randomly signed up to participate.

The concept was simple: People signed up, were given questions about world events (e.g. Would North Korea launch a missile in 2014?), and would offer their opinion about the probability of the event occurring. The winning university team defined three factors that predicted the success of their system:[6]

1. Creating a one hour probability training module for the user to watch prior to participating;

2. Placing people on teams instead of having them work individually;

3. Tracking which users were better than others and advancing them to more difficult questions.

As the research builds surrounding the best way to aggregate and combine non-expert opinions on matters affecting the general public, we will see a shift in the way decisions are made. Instead of legislators relying on experts who might have their own agenda or are limited by the number of hours in a day, they will be able to ask the crowd for their input and predictions surrounding important decisions and needed information for policymaking. However, we should proceed with caution. More research is needed to design systems with safeguards that prevent over confidence issues in "crowd thinking," which increases the possibility of group think and selection of poor answers.[7]

The Good Judgement Project highlights both the need for sustaining awareness of the power of open participation models in government and an excellent example of government investing, developing, and refining these methods.

In the same vein, Science Hack Day was an experiment to grow awareness of the hackathon model for public participation and to break the mold of the usual event model at the Wilson Center. It also served as a participant observation study on the effectiveness of using open participation models to find ways to use government data, focus on pressing challenges and blend the disciplines of art and science.

What is Science Hack Day

Science Hack Day (SHD) is an event based on a *hackathon* model, where participants are invited to a venue to work on a problem on teams or as individuals for two full days (48 hours). To understand SHD, the history of hackathons should be briefly mentioned. The hackathon format ("hack[8]" + "marathon") has roots in the Home Brew Computer Club started in 1975.[9] This club was a grassroots meeting of like-minded technology hobbyists in Silicon Valley in the United States and the genesis of Apple Computers. Across the nation similar clubs were forming and sharing information with one another. The name hackathon was coined in 1999 when OpenBSD, an open-source group of technologists in Canada, and Sun Microsystems, a technology company, simultaneously held independent gatherings to fix technical problems the groups were having.[10]

In the past decades, the hackathon model evolved. First into a matchmaking event between entrepreneurs and developers and then into a recruitment tool used by technology companies. Since 2009, there has been a noted shift towards hacking a topic or theme, with the interest of attracting a specific audience for focused innovation efforts.[11] For example, a hackathon might focus on a theme like music or transportation and the participants need not be programmers but simply interested (or an expert) in a specific field. Civic hacking has also exploded with the onset of government programs like Code for America.[12]

SHD, started by Ariel Waldman[13], is part of this evolution as it focuses on using the scientific process to achieve a goal. **The goals of SHD are to reduce the barriers and perceptions that science is only for professionals and produce open-minded and curious individuals. The goal of encouraging public participation is also a core tenant in the citizen science (or public participation in scientific research), where individuals, usually without formal training, participate in scientific research.** It also emphasizes an open-source format, using freely available data and encouraging participants of every background to attend in order to facilitate a mashup of artists, designers, scientists, and developers.

Event Breakdown

Science Hack Day DC was the 51st Science Hack Day event. Each SHD unfolds on a similar schedule. The event traditionally runs from 9 AM on Saturday morning to 4 PM on Sunday afternoon. Science Hack Day is intentionally held outside of regular working hours to encourage wider participation. In the morning, a curated list of lighting talks (e.g., 5-minute speed talks) is presented, each introducing an idea, dataset, or tool that might inspire hackers.[14] After the lighting talks, participants mix and mingle over lunch. Then the hackers are prompted to self-organize, floating between groups that interest them. Some may eventually settle on a set team, while others may choose to hop from team to team.

Dinner is served and then participants are "locked out/in" after 10PM. Some choose to hack through the night, others find a couple hours to sleep, and everyone reconvenes in the morning for breakfast. At 1:30 PM, all participants submit their hack through an online submission form and at 2 PM each team has two and a half minutes to present their hack to a panel of judges.[15] After the presentations, the judges deliberate and reconvene to announce winners in the following categories: data, hardware, design, and best in show. Because this Science Hack Day was held in Washington, DC, a special policy category was added.

DC Science Hack Day Model & Partnerships

The Commons Lab of the Wilson Center partnered with the ARTSEDGE program of the John F. Kennedy Center for Performing Arts to combine their art network and our science and technology network. In an effort to encourage these types of open participation models in government, the Commons Lab curated the lightning talks to come from employees of federal agencies such as the State Department, Environmental Protection Agency, National Institutes of Health, and the National Aeronautics and Space Administration.

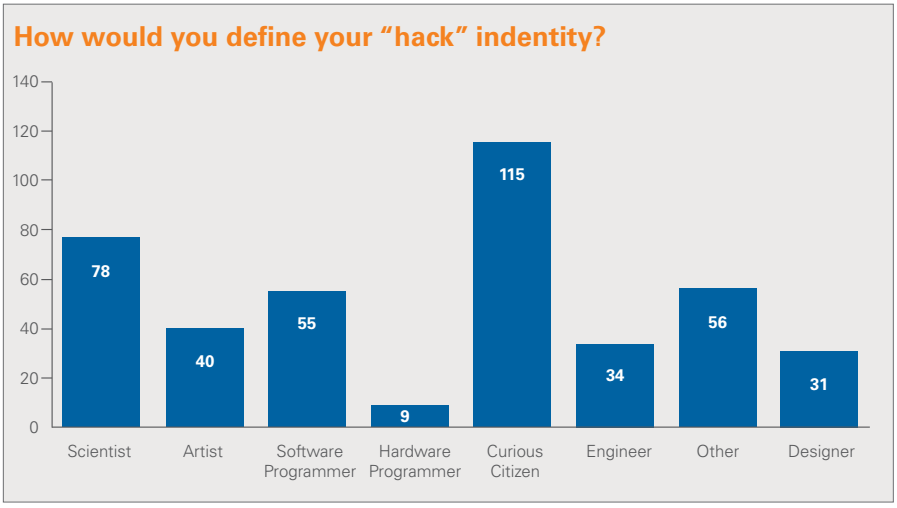
Thompson Reuter's ENDNOTE, a sponsor of Science Hack Days around the world, provided a grant to support DC SHD. Github, an online code repository, offered their services during the weekend and a free year-long membership for the winning teams; Ifixit, a do-it-yourself online resource donated their software fixing toolkits; and Cards Against Humanity, donated copies of their card game as a prize.

Participation Metrics

We marketed the event to local meetup[16] groups, such as Code for DC and GeoDC, local universities, government agencies, and local libraries. ARTSEDGE utilized their educational and arts network for targeted marketing.

Two hundred and fifty-three people registered for the event. During registration participants were asked to choose a "hack identity," including: scientist, artist, software programmer, hardware programmer, curious citizen, engineer, designer and other. We intentionally allowed participants to choose more than one category to see if the people signing up were self-identifying as multi-disciplinary, which is reflected in the metrics on Figure 1 (Page 7).

Figure 1. Hack Identities of SHD Participants



Part of the registration process required participants to answer the question above. They were allowed to select more than one option. The 253 registrants cast 418 votes, showing participants clearly identified with multiple categories.

More than 100 people attended throughout the weekend, with about 40 people staying throughout the entire event. In a surprising deviation from the traditional hackathon/technology audience[17] (White or Asian, young and male), we had an incredibly diverse crowd. It is a possibility that, through marketing to the diverse networks of art, education, policy, and science, we built in diversity from the start. Participant age was also incredibly variable, ranging from 10 to 80 years old. Gender followed around a 30 percent female to 70 percent male breakdown in participants.[18]

Drawing from previous government hackathons, we reused the legal language from a document provided at a Department of the Interior hackathon[19], outlining that the hacks produced at the event must be made available in the public domain, but **specifying that the intellectual property rights belong to the group that created the hack.** We felt it was vital to make this clear from the start in order to encourage creative freedom, but also to ensure the works will be made widely available to others to use should they move beyond prototype phase.[20] This also provides a sense of reciprocity, in that we are not asking for the hackers to provide us with free labor, but we were providing a space (literally and digitally) where participants can ponder, interact, and make use of publically available data.[21]

What's Next: After Science Hack Day

A common theme in hackathon research is the sustainability of the hacks produced, and what happens to the teams following such an energizing event. We attempted to quantify the continuity of hacks from previous SHDs by calculating the number of hacks with still-active links on the wiki. However this unit of measurement proved ambiguous: Domain names change and some of the more physical hacks may never have established a web presence in the first place. When we asked previous organizers of SHDs for follow-up data concerning the continuity of hacks following their events, one organizer replied with the following:

"The longer answer is that there is plenty of anecdotal evidence of continuations, which vary wildly in terms of how they're continued and sometimes are carried on by people who never interacted with the original team. Some hacks are immediately continued, while others might go quiet for a couple years before being picked up again. Some hacks are direct inspirations for other creations, but the hack itself isn't used after the event. I have a lot of stories but I am unable to even provide a ballpark percentage on continuation versus not, as we simply don't have the data and attempting to track the longtail of each hack would be very difficult since sometimes even the original teams don't know when their hacks get continued."[22]

Herein highlights the difficulty in monitoring and evaluating outcomes of hackathons because the unit of measurement is fluid, dynamic, and changing – quite like the relationships built at the hackathons.

As noted by Rose Eveleth of *The Atlantic*,[23] *"Hackathons are often most useful to the hackers themselves—participants come and work through ideas, meet one another, and learn new tricks and coding languages. They're great events for community building, for publicity, and for experimentation, but rarely—in my experience—do hackathons create lasting, useful projects."* Forming relationships becomes the most valuable outcome of hackathons, which is consistent with most hackathon research. [24]

This is best demonstrated in the follow-up emails from the participants in the event. They imply the value the participants felt surrounding the relationships and connections made:

"Not only did I have a blast presenting and advising a few groups, but I also had fun messing around with my own hack."

"Thank you for a fantastic weekend – I really enjoyed the experience, especially connecting with people I likely never would have encountered otherwise. It was really fun to think creatively all weekend!"

"Thank you for organizing the Science Hack Day. I had a blast. I'm trying to convince the team to continue building out an [hack name omitted to preserve anonymity] – we have built algorithms and tested the tech, we just need a robust machine learning training data set to build out a service."

While the evidence mostly points towards the value of relationships, there were some immediate tangible outcomes observed afterwards. The hack team that won the policy award, PoliConnect, was invited back to the Wilson Center to demo their platform to their intended community: policy experts and lawmakers. They even took the initiative to incorporate themselves as a Limited Liability Corporation with plans to expand the platform to other subjects, such as tackling constructive feedback in large corporations. The best-use-of-data hack, If No One Hears It, was invited to present at NASA Goddard Space Flight Center's science jamboree. The participants behind the hack have incorporated their work into a website.[25]

The John F. Kennedy Center for the Performing Arts ArtsEdge program is interested in hosting the event next year, along with a PhD student from the University of Maryland. The continuity of the event itself might prove as the best tangible outcome yet.

Conclusion, Implications, and Future Work

The U.S. government is making huge strides in opening up the policymaking process to the public.[26] Evidence of this comes in the National Action Plans for Open Government, which is currently using a Hackpad (a document-editing software that allows multiple users to edit at a single time) to generate ideas for its third iteration.[27] The growing number of hackathons hosted by government agencies such as the Agency for International Development, Department of the Interior and State Department also indicates a willingness to try something new. In addition, the Office of Science and Technology Policy in the White House, in collaboration with the Federal Community of Practice on Citizen Science and Crowdsourcing,[28] is developing a toolkit to support government employees in using open participation models such as citizen science and crowdsourcing to achieve federal employees' work goals.[29]

Learning from other models will be necessary to design and incorporate open participation models in government. The European Union (EU) has made significant steps towards including the public in scientific research and policy.[30] One example of this is the EU Commission's funding of "Citizens' Observatories," which "develop community-based environmental monitoring and information systems."[31] For example, COBWEB (Citizen Observatory Web), is developing an observatory framework that incorporates citizen data collection on biosphere reserves.[32] It combines reference data from authoritative sources with citizen-generated data to create a mashup of geographic data sets for policy makers and land managers.

There are limiting factors and research gaps still to be addressed for using open participation models in government. As evidenced in the Good Judgement Project and a robust body of literature on collective intelligence[33], there are pitfalls to be avoided and best practices to be followed when engaging the public in problem solving. Also, volunteers and participants in public participation in scientific research require significant resources and human capital investment to keep them interested and to ensure quality control and assurance.[34]

An additional consideration is needed in addressing diversity and inclusion in these open government processes. For example, when the Wikimedia Foundation

and UNU-Merit conducted a multilingual study on the demographics of Wikipedia users, they found 87 percent of contributors were male.[35] While it's encouraging to think one is garnering wider input from a larger audience, government must remain vigilant in understanding the demographics of the volunteer groups to avoid coming to conclusions based on a segmented part of the public. Government practitioners must keep in mind access issues if they hope to engage an accurate representation of the public in a decision-making process that affects all.

The benefits of public participation are multifold: doing more with less, leveraging the power of the crowd, and sustaining a more transparent process. But there are costs that still need to be recognized and planned for. Liaison organizations that specialize in volunteer management and professional associations that support research and practice are one easy target for investing research funds and building the infrastructure and human capital needed to execute these projects. Another is continual funding for studying best practices, as conducted by the Good Judgement Project.

By acknowledging the limits of open-participation models and tackling the emerging challenges, we can usher in the digital age of government and increased public participation in an equal and effective manner. By intentionally aligning government processes, policies, and missions with open-participation models, we can tackle the increasingly complex and wicked challenges of our time.[36]

Hacks

After SHD, we asked each team to submit a brief profile of their project, asking them to answer the following prompts:

- Describe each hacker's identity (scientists, software programmer, hardware programmer, curious citizen, designer, artist, engineer).
- A paragraph describing the project.
- A paragraph on the origin/how the team came to that idea and decided to pursue it.

Each team that answered the questions is included in the following summary pages.

PoliConnect – Policy Award

HACKERS: Nic Small (Coder), Isatu (Isa) Conteh (Coder), Dan Morgan-Russell (Designer), Don McLamb (Coder), Liban Hassan (Coder), Brad Foster (Coder).

Tools[36]

Ruby on Rails, HTML, CSS, Gems (pry, devise, faker, and cancancan), and Amazon Web Services hosting

Origin

In remarks at the Wilson Center this spring,[38] Former Secretary of State Madeleine Albright said there is a wealth of academic information about policy coming from think tanks, but that lawmakers never use that information. Part of the problem is that lawmakers cannot openly ask certain questions about radical initiatives without being vilified in the press along partisan lines. Think tanks already host closed-door sessions where lawmakers and experts interact, but this is inefficient unless everyone involved lives in Washington, D.C. We want to fix this issue with PoliConnect, where users can anonymously connect and ask these important questions without fearing press inquiry and political retribution.

Project Description

PoliConnect is an online forum where lawmakers and policy experts can anonymously connect to ask honest questions and provide detailed answers. A better connection between lawmakers and experts facilitates more informed public policy decisions. Email verification for lawmakers and eperts with .gov or .edu emails (afterwards, no user information is stored, preserving anonymity), Q&A forums with posts without usernames, tag system to categorize and sort posts.

Features to add in the future: Voting system to promote well-researched and expertly argued answers. Integrated Tor system for anonymity. Replace email information with secret, unlisted username.

Foot Notes – Design Award

HACKERS: Gene Park (Curious Citizen), Kelly Chang (Biomedical Engineer), Andrew Cheng (Biomedical Engineer), Brent Millare (Biodmedical Engineer).

Tools

Clojur, Overtone, SuperCollider, MATLAB, and Youtube

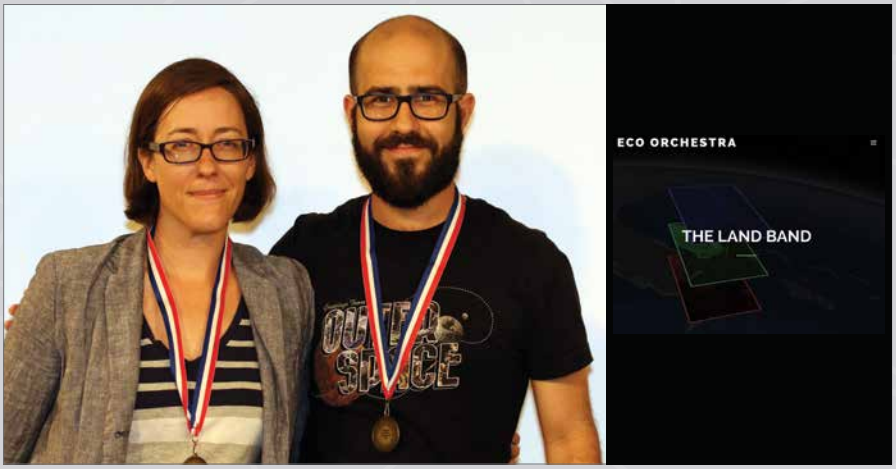
Origin

Our team has run in a lot of road races and marathons, and we've all personally experienced the challenges of trying to change our running habits or maintain good form a couple of hours into a run. Gene proposed this idea at the hackathon, and we all thought it was a great way to address this challenge. Beyond running, we thought that real-time, auditory feedback could also help rehabilitation patients who are learning to walk again. It could also be used to make music by dancing!

Project Description

Foot Notes is a project to create auditory feedback from different gait patterns during walking, running, or other sports. We convert pressure sensor data from the sole of the foot into patterns of percussive beats and/or musical chords. In many sports, video analysis is done to highlight flaws or bad habits in an athlete's technique. Though this provides useful visual feedback, it is usually not done in real time, making it difficult for an athlete to remember or implement the desired changes in the hours, days, or weeks following a video session. Our goal is to provide informative real-time feedback for athletes or rehabilitation patients trying to alter their gait mechanics.

If No One Hears It. . . – Best Use of Data Award



HACKERS: Tracey Bell (Arts Manager who loves science) and David Lagomasino (NASA Scientist who loves art).

Tools

R programming language, .wav sound files, and the academic text Bearman, N., and P.F. Fisher. (2012). Using sound to represent spatial data in ArcGIS. Computers and Geosciences. 46: 157-163.

Origin

Artist Tracey Bell and scientist David Lagomasino both attended SHD to observe, but were inspired by the collaborative energy of SHD to consider new ways of utilizing Landsat data. In researching their idea, they found examples of sound being used to explore other types of spatial data and music to represent scientific data, but they did not find examples that let the land speak for itself. Future plans for this prototype include further collaboration to create more complex compositions, time-based art, exhibitions, and exploration of the scientific implications of using sound as a method to detect change in satellite imagery.

Project Description

There is an age-old question: If a tree falls in the forest, and nobody is around to hear it, does it make a sound? We are inundated with images in the media depicting the effects of climate change, deforestation, and urbanization to the point we risk becoming numb to the underlying message of our role in shaping the future of our planet. “If no one hears it…” provides a new way to engage audiences in a conversation about deforestation using music to highlight changes in the landscape. Landsat images have multiple layers of data, each representing a different electromagnetic wavelength. This program utilizes the programing language R to transform that data into sound. The initial prototype selected three bands of Landsat data, and pixel by pixel, correlated them with .wav files to create chords. Different land cover types can be audibly distinguished based on the sound of the chords. In its final form, users will be able to compose their own music, using time, landscape, location, or even individual clouds to control their composition.

Inspirit.com – Inspiration Award Winner

HACKERS: Nathan Hagan (Coder), Katherine McClintic (Coder), Andrew Macintyre (Scientist, Diversity Policy Entrepreneur), Isabella Troconis (Artist, Designer), Thierry Uwilingiyimana (Coder, Engineer, Education Policy Entrepreneur), Denis Baranov (UX Designer), Austin Nichols (Data Scientist, Design Thinker, Economist), and Elsa Pirozzi (Student, Scientist, Artist)

Tools

Mock ups were produced in Photoshop and Illustrator

Origin

Katherine McClintic made a pitch for an "inspiration deck," where people could post and save inspirational stories, and Andrew Macintyre was talking up the idea of a mentor network. Isabella Troconis wanted to develop an app to improve communication across cultures. Thierry Uwilingiyimana, Austin Nichols, and Elsa Pirozzi had been talking about how to improve educational outcomes via networks and mentorship at a table before the pitch session, so they brought their ideas to that conversation. Nathan Tyler Hagan and Denis Baranov joined the team as they moved to the design/prototype phase, and Nathan took the lead on developing the visual prototype.

Project Description

Inspirit is an app focused on promoting inspiration and mentorship for under-represented groups in STEM fields and entrepreneurship. People can search the app based on general and specific categories, as well as user-generated tags. They can "like" inspirational people and save them to their own deck. They can also be matched up with peer mentors based on the similarity of their decks and proximity.

The key solution is to build a platform to search and save inspirational stories (like Pinterest, Reddit, or Tumblr, but with a tighter focus), then to link people into a peer mentor network via an algorithm that matches people based on interests and characteristics and recommends new stories using a similar algorithm (like Netflix). There is also the potential to build a progression into professional mentorship for users who demonstrate the needed skills and paid membership levels that get users access to professional mentors to create a long-term sustainable business model.

Predictive Modeling of Areas Similar to Protected Landscapes

HACKERS: Michael Lerner (Curious Citizen) and Alexander Egorenkov (Curious Citizen and Coder)

Tools

EnviroAtlas, USGS, R, and QGIS

Origin

We were impressed with the Environmental Protection Agency's EnviroAtlas database and, with both of us working at environmental NGOs (Resources for the Future and the Environmental Law Institute), we decided to create a project using the data available through EnviroAtlas. The day before the hack, Michael had been talking with someone who remarked that the distinction between protected areas and unprotected areas often appears arbitrary when the land is of similar character. Following the presentation of EnviroAtlas by Anne Neale of the EPA, we realized that we could leverage the variety and granularity of the data in EnviroAtlas to create a predictive model capable of identifying unprotected areas that present similar characteristics to protected areas.

Project Description

The Protected Areas of the United States are a collection of landscapes believed to hold sufficient value to merit conservation. We have created a statistical model that combines a collection of factors to: 1) predict if an area is currently under ecological conservation, and 2) identify unprotected areas that have similar characteristics to protected areas. Our results show that many unprotected areas share the features of protected landscapes, suggesting that they, too, may deserve conservation. This tool can help conservation experts prioritize and justify advocacy for the expansion of ecological conservation areas.

Golden Record 2.0 – Best in Show

HACKERS: Allen Brooks (Artist), Mike Chelen (Artist), Laura Townsend, Tiffany Bryant (Artist), Beth Tuck (Scientist), Susan O'Connor (Artist), BA Cockburn (Artist), Margaret MacDonald (Artist, Scientist), Mary Lynne Dittmarr (Scientist), Richard Conroy, Doug Cooney (Artist), and Kristen Mitchell (Artist)

Tools

Nick Goldman, Paul Bertone, et. al. (2013). Toward practical high-capacity low-maintenance storage of digital information in synthesized DNA. Nature Letters, 494(7435), pp. 77-80.

Origin

We were interested in developing content for the next Voyager mission. Our world has changed drastically since the first Voyager mission in 1977. The questions that guided the development of this were: How do we send a new cultural picture into the stars? What medium will we use?

Project Description

The solution was to encode information in DNA due to its desirable qualities: DNA is small, capable of storing a high density of information, and highly stable due to its redundancy and structure. Questions that still need to addressed are: What types of information should be included? How do we protect DNA from radiation? How would extraterrestrial life be able to read the DNA?

LickitySplit – People's Choice Award

HACKERS: Julia Winn (Artist, Coder, Designer), David Naffis(Coder, Hardware Programmer), and Jeff Chen (Data Scientist, Coder, Artist)

Tools

HTML5, CSS, Javascript, Ruby on Rails, Amazon Web Services, OpenSCAD, SketchUp, Printrbot, and Webcam

Origin

LickitySplit is a FitBit for your spit. LickitySplit is a medical device that leverages visible light spectroscopy to analyze the content of saliva samples. This data is collected as waves of light and imported into our data analysis and visualization platform. Using open-source tools from the non-profit Public Lab, the light waves could be correlated with various health states.

One of the most common health states light spectroscopy has been used to detect is the level of cortisol present in saliva. Cortisol is a steroid hormone that is indicative of many emotional and physiological states, including stress levels, pregnancy, and age. Additionally, light spectroscopy has been used to detect proteins from recently consumed foods.

As such, the product has the potential to identify potential health risks and chemical imbalances instantly, providing great value to researchers, and individuals alike.

Project Description

We started off making imitation designer jewelry with a 3D printer. This gave us an opportunity to teach some of the younger attendees about the wonders of 3D printing and the power of branding: How a simple logo can increase a piece of plastic's perceived value by hundreds or even thousands of dollars. Furthermore, we realized this effort would improve access to those who cannot afford designer jewelry, enabling the proliferation of brands like Fofo Fhanel and Fiffany.

The clear benefit of access to a 3D printer is that anything is possible, whether it is for design endeavors or for science. We then focused our attention on improving access to quick, inexpensive health testing by capitalizing upon a commonly available substance: saliva. With the remaining 15 hours of hack time, our efforts concentrated upon designing and printing an open-source saliva spectroscopy kit furnished with prototype dashboards and algorithms.

Appendix I: Tools Glossary

Ruby on Rails – An open source web framework and suite of tools that enables you to build web pages and content

Gems – Pry, devise, faker, and cancancan – Reusable code, which is packaged for redistribution and hosted on Ruby on Rails

HTML and CSS – Coding languages used in web development

Amazon Web Services – Hosting services for all components of building a website on the Amazon server

Clojur – A general-purpose computer programming language

Overtone – Open-source audio environment designed to encourage mixing and mashing of different types of audio

SuperCollider – Programming language for real-time audio synthesis and algorithmic composition

MATLAB – High-level language and interactive environment, used by scientists and engineers to explore and visualize ideas

Youtube – Video-hosting platform

HTML5 – The newest version of a core technology markup programming language that structures and presents content on the World Wide Web

OpenSCAD – A free software that allows programmers to model 3D objects

SketchUp – A software used to model 3D objects, which is used by engineers, architects, and designers

Printrbot – Desktop 3D or additive printers, which are known for their affordability

Webcam – Internal camera on a computer that takes and processes images.

Appendix II: Schedule & Lightning Talks

Saturday May 16th

Time	What	Where
9:00 AM – 10:00 AM	**Check-in & Breakfast:** Coffee, Egg Sandwiches, Fruit and Yogurt	Check-in: Ground Floor Breakfast: 6th Floor Dining Room
10:00 AM – 10:15 AM	**Welcome & Housekeeping:** Elizabeth Tyson, Wilson Center Nuit Hansgen, Kennedy Center Ariel Waldman, Founder, Science Hack Day	6th Floor Auditorium Overflow Room: 6th Floor Boardroom & Dining Room
10:15 AM – 11:15 AM	**Lightning Talks** (Details on Page 5)	6th Floor Auditorium Overflow Room: 6th Floor Boardroom & Dining Room
11:30 AM – 12:00 PM	**Self-Organize!** Mingle while lunch is being prepared	6th Floor Auditorium, Boardroom & Dining Room
12:00 PM – 1:00 PM	**Lunch:** Variety of Sandwiches, Pasta Salad, Chips and Soda	6th Floor Dining Room
1:00 PM – 6:00 PM	**Hacking!** Resources available can be found on Page 6	Participants are welcome to spread out across the Wilson Center in any of the following rooms: 6th Floor Boardroom, Dining Room & Auditorium 5th Floor Boardroom 4th Floor Conference Room 4th Floor Atrium *Please note that the 3rd, 7th & 8th floors and all offices are off limits. Wilson Center scholars may be working on Saturday and Sunday so please respect their space*
6:00 PM – 7:00 PM	**Project Progress Report Out (not mandatory):** Use this time to share your teams work and recruit others for troubleshooting or feedback	6th Floor Auditorium
7:00 PM	**Dinner:** Pizza (courtesy of wethepizza) and Soda	6th Floor Dining Room
8:00 PM	**Science Trivia (with Prizes!)** Hosted by the ingenious Kennedy Center Folks	6th Floor Dining Room
10:00 PM – Overnight	**Lock Out:** You may leave the Wilson Center but you will not be able to get back in. Only participant's age +21 will be able to stay overnight.	Guards will be on duty at the Wilson Center entrance throughout the night should there be an emergency. 4th Floor Conference room will be designated "sleeping room"

Sunday May 17th

Time	What	Where
9:00 AM – 10:00 AM	**Doors Open & Breakfast:** Coffee, Pastries, Fruit and Yogurt	Check-in: Ground Floor Breakfast: 6th Floor Dining Room
10:00 AM – 10:15 AM	**Progress Updates (not mandatory):** Use this time to share your teams work and others for troubleshooting or feedback	6th Floor Auditorium
10:00 AM – 12:00 PM	**Hacking!**	4th – 6th Floors
12:00 PM – 1:00 PM	**Lunch:** Variety of Sandwiches, Grilled Asparagus, Potato Salad, Chips and Soda	6th Floor Dining Room
1:30 PM	**Upload Team Details for Demos:** All demos must be uploaded to the GoogleDoc (Instructions on page 6)	6th Floor Auditorium
2:00 PM – 3:30 PM	**Final Demos** Teams will present their hack to the community in 2.5 minutes	6th Floor Auditorium Overflow Room: 6th Floor Boardroom
3:30 PM – 4:00 PM	**Judging** (Categories on Page 6) Beth Beck, NASA Greg Godbout, EPA Lakita Edwards, NEA Steven Kostant, TidePool Media	6th Floor Auditorium
4:00 PM	**Awards Ceremony and Closing Remarks**	

Lightning Talks

Time	Speaker	ORGANIZATION	THEME
10:20 – 10:25	*Greg Poljacik,* Stuntman-Scientist	John F. Kennedy Center for the Performing Arts	*Emotional Contagion* – can we place sensors on audiences to prove this theory?
10:25 – 10:30	*Anne Neale,* EnviroAtlas Project Lead	Environmental Protection Agency	*EnviroAtlas* – an online geospatial data resource managed by the EPA and available to external application builders
10:30 – 10:35	*Talia Fox,* Research Associate	Environmental Law Institute	*Methane Hunting* – how can we use sensors and citizens to track down rogue methane gas?
10:35 – 10:40	*Allen Brooks,* Interactive Content Producer	John F. Kennedy Center for the Performing Arts	*Voyager X* – 40 years ago, we sent a probe into the void carrying a cultural snapshot of the world in 1977. How do we send a new cultural picture into the stars? What medium will we use?
10:45 – 10:50	*David Lagomasino,* Biospheric Sciences Lab	National Aeronautics and Space Administration	*Ground-Truthing Land Use Change* – designing a platform to capture citizen science data on land-use change in order to ground-truth NASA satellite data of forest coverage
10:50 – 10:55	*Thomas Debass,* Deputy Special Representative	State Department	*Coding for Fish* – what types of open data are available to improve the livelihoods of fishers around the world?
10:55 – 11:00	*Elizabeth Tuck,* Genetics and Education Fellow	National Institutes of Health	*DIYBiohacking* – what is it, what types of resources are available and what could you make?
11:00 – 11:05	*Doug Cooney,* Playwright, Author, Professor	John F. Kennedy Center for the Performing Arts	*Making Modern Monsters* – connecting Frankenstein's creature to contemporary science and arts learning
11:05 – 11:10	*Sophia Liu,* Mendenhall Postdoc Fellow	US Geological Survey	*Open Data Storytelling* – Integrate USGS mineral datasets with other datasets to uncover any economic, environmental, geopolitical, or public health consequences from developing, using, and disposing critical minerals.
11:10 – 11:15	*James Tyrwhitt-Drake,* Graphics Design & Visualization Expert	National Institutes of Health	*3D Print Exchange* – What is it and how can you contribute to it?
11:15 -11:20	*Abdulkader Sinno,* Global Europe & Middle East Program Fellow	Woodrow Wilson International Wilson Center for Scholars	*UAVs for Forest Canopy Research* – Can we develop a cost effective and efficient method to collect canopy samples to determine air purification of forests?
11:20-11:25	*Alyson Williams,* Knowledge & Learning Specialist	Inter-American Development Bank	*Numbers for Development* – Open Data Portal, allows you to explore, visualize and reuse the Bank's data on social and economic development in Latin America and the Caribbean

Appendix III: Legal Documents

Legal document we asked participants to sign before they entered the building.

Participation

DC Science Hack Day will be held at the Ronald Reagan Building in Washington, D.C. over the weekend of May 16th & 17th. You hereby certify and agree that your participation is fully voluntary and that you are not entitled to compensation, nor are you considered an employee of the United States for purposed of this event.

Furthermore, if you are a regular employee of the U.S. or D.C. Government, you hereby certify and agree that your engagement in the Summit is in your personal capacity (i.e., identifying yourself by your own name and without referencing your Federal employment) and on a voluntary basis outside of your working hours, and you will not be entitled to compensation for your time. Furthermore, you understand that any Federal Employee participating in their personal capacity should contact their Ethics Official to ensure they are in compliance with all ethics laws and regulations.

If you are a Federal contractor employee, you hereby certify and agree that you are participating in your personal capacity and that you understand that all questions regarding your participation should be directed to the corresponding contracting officer.

Intellectual Property

The Woodrow Wilson International Center for Scholars, The Kennedy Center for the Arts, Thomson Reuters End Note and GitHub (collectively referred to as the "**Organizers**") make no claims to any intellectual property (IP) generated during DC Science Hack Day held at the Ronald Reagan Building in Washington, D.C. over the weekend of May 16th & 17th. The DC Science Hack Day goal is to bring together a diverse group of people to tackle challenges facing the civic center using hardware, software and science. By sharing any Solution Materials to or at the event, you hereby grant to the Organizers and all participants, their agents and affiliates, a non-exclusive, perpetual, irrevocable, worldwide and royalty-free license to display, copy, combine, compile, distribute, sublicense and disseminate your Solution Materials in the form shared by you or as a derivative or adapted work as needed to support DC Science Hack Day initiative. Solution Materials are any data, software (including source code and object code) or other Solution Materials subject to intellectual property ("IP") or other proprietary protections applicable to you or a third party.

All participants are subject to preexisting contractual agreements regarding conflict of interest and IP ownership with their employees, investors, and any other agreement to this regard. If a member of a team is subject to any such policy or contract, his or her share of the IP generation during DC Science Hack Day will be subject to the terms of the agreement and/or policy.

If you are working as a team, your team is responsible for determining the ownership rights between team members for any IP and any material developed during the event. Organizers shall not be in any way responsible for any disputes among members of any team in connection with intellectual property ownership or conflict of interest issues.

Use of Third Party Materials

If your Solution Materials include the use of non-government materials (such as a dataset or code), you are responsible for ensuring that your Solution Materials are available without restriction. You are solely responsible for all required verification or investigation of the availability of your Solution Materials prior to sharing your solution.

Warranties

You hereby represent and warrant the following: (a) that you have sufficient rights, including intellectual property, trade secret, privacy and publicity rights to authorize any use, including publication and dissemination, of your Solution Materials to support the DC Science Hack Day and to use and to authorize others to use your Solution Materials, whether those Solution Materials are owned by you or others; (b) you will not share content that is copyrighted, protected by trade secret or otherwise subject to third party intellectual property rights or other proprietary rights, including privacy and publicity rights, unless you are the owner of such rights of have permission from their rightful owner to share the content and to grant all participants all the rights required for use; (c) you will not publish falsehoods or misrepresentations that could damage the DC Science Hack Day, or any third party; (d) you will not share content that is unlawful, obscene, defamatory, libelous, threatening, pornographic, harassing, hateful, racially or ethnically offensive, or encourages conduct that would be considered a criminal offense, give rise to civil liability, violate any law, or is otherwise inappropriate of destructive to the Organizers or its sponsors' brand image or goodwill; DC Science Hack Day and its Organizers will not be obligated to pay any compensation to, or permit any participation by any third party in connection with the use, reproduction, modification, publication, display or other exploitation of any of the content that you submit; and (f) the Solution Materials shared by you do not contain any viruses, Trojan horses, worms or other disabling devices or harmful code.

Publicity/Photography

Individuals attending Woodrow Wilson Center events may be audiotaped, videotaped, or photographed during the course of a meeting, and by attending grant permission for their likenesses and the content of their comments, if any, to be broadcast, webcast, published, or otherwise reported or recorded.

If you wish not to be filmed, please ask the staff member at the check-in desk for

a sticker to wear on your sleeve or badge at all times which indicates this.

Liability

The Organizers are not responsible for the conduct of any DC Science Hack Day events or participants. You hereby agree to release and hold the Organizers and related entities harmless against any and all claims against them resulting from your breach of any of the representations, warranties or obligations contained in this Agreement, including claims related to the use of your Solution Materials.

You hereby assume any and all risks to you associated with your sharing of Solution Materials. Therefore, you also hereby waive and release any and all claims or causes of action against Organizers and their officers, employees and agents for any and all injury and damage of any nature whatsoever (whether existing or thereafter arising, whether direct, indirect, or consequential and whether foreseeable or not), arising from the sharing of your Solution Materials.

CAUTION: Any attempt to deliberately damage any website or undermine the legitimate operation of the initiative is a violation of criminal and civil laws and should such an attempt be made, the government reserves the right to seek damages or other remedies from any such person (s) responsible for the attempt to the fullest extent permitted by the law.

Appendix IV: Judges Bio's

Two of the four judges provided us with photos and a bio. The other two judges were Greg Godbout from the Environmental Protection Agency and Steven Kostant from TidePool Media.

Beth Beck

Open Innovation Program Manager, NASA

"Judging citizen-generated innovative thinking is always a joy. I jump at the opportunity to see what creative minds can do, which is why I was thrilled to be a Space Hack judge. I loved the students who worked so hard on the Minecraft Hack. It didn't work for the demo, but we all wanted it to. I loved how the audience was willing to wait for the team to come to the stage after the project broke. They were willing to suspend the relatively strict rules on how much time each team gets on stage. I saw in this moment the collaborative generosity of spirit that demonstrates the best in us as humans. I felt encouraged and refreshed…and ready to tackle work the following day. We can never thank enough the participants who are willing to give up their weekends to come together as teams to solve global issues…with data. Awesome!"

Lakita Edwards

Arts Education Specialist, National Endowment for the Arts

"The mission of the National Endowment for the Arts is to strengthen the creative capacity of our communities by providing all Americans with diverse opportunities for arts participation. While science and the arts are distinct fields—both fields cultivate a creative mind set and integrate iteration and design-thinking strategies. A hackathon is a natural confluence of the arts and sciences; consequently, I enjoyed interacting with my fellow judges who reflected expertise from both areas. To paraphrase Star Trek's Mr. Spock: accepting the invitation to be a judge in DC's first-ever Science Hack Day was highly logical!"

ENDNOTES

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8 A hack is a creative solution to a problem, maybe not the most elegant but often the cleverest.

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15 See some of the judges profiles in the Appendix IV (Page 24)

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19 For an example of this document see Appendix III (Page 22)

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37 See Appendix I on Page 18 for a definition of these tools

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The Commons Lab of STIP seeks to mobilize public participation and innovation in science, technology and policy.

http://CommonsLab.wilsoncenter.org

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