



NATIONAL HIGH  
**M**MAGNETIC  
FIELD LABORATORY

# Broadening Impact through Education and Outreach

Roxanne Hughes, Ph.D. and Kristin Roberts  
National High Magnetic Field Laboratory



# Expertise of Team

- Roxanne Hughes: Director of the Center for Integrating Research and Learning who has expertise in science education research, specifically research on the persistence and lack thereof of marginalized groups
  - Jose Sanchez, expertise in Physics education, teacher pedagogy, mentoring at the higher education level
  - Carlos Villa, expertise in physical science informal education, teacher pedagogy, middle school focus
  - Kari Roberts, expertise in statistical analysis, evaluation, and mentoring at the higher education level
- Kristin Roberts: Director of Public Affairs who has expertise in marketing and science communication
  - Kristen Coyne, expertise in journalism, writing, editing
  - Caroline McNiel, expertise in art direction, graphic design and brand creation
  - Stephen Bilenky, expertise in photo and video storytelling
  - Nilubon Tabtimtong, expertise in web design and programming





# Allows the MagLab to Accomplish it's mission

- The MagLab is committed to education and outreach. Our programs are designed to excite and educate students, teachers and the general public about science, technology and the world around.
- The MagLab is committed to increasing diversity in the STEM workforce through our outreach, education and mentoring programs.
- The combined expertise of our staff results in programs that build our STEM workforce beginning at the K-12 level and continuing into college, graduate school, and the postdoc.



# Broadening Participation for K-12 students

Carlos Villa – Project Manager

	K-12 Educational Outreach (~5000 students/year)	Middle School Mentorship (~20 students/year)	Middle School Summer Camps (~100 students/year)
Description	Visits to K-12 school classrooms. And school groups coming to the lab. Eleven MagLab related curricula.	Middle school students work in pairs with MagLab scientist on a research project during each fall semester	1-2 week camps for middle school students: <ul style="list-style-type: none"><li>- Camp TESLA, coed</li><li>- SciGirls Coding</li><li>- SciGirls 1 and 2</li></ul>
Goals	<ul style="list-style-type: none"><li>• Broaden participation of students by educating teachers</li><li>• Connect MagLab science to K-12 curriculum</li></ul> 	<p>Improve STEM Identity and broaden participation</p> <ul style="list-style-type: none"><li>• Provide students opportunities to engage in hands-on science activities</li><li>• Expose students to science careers and role models</li></ul>	<p>Improve STEM Identity and broaden participation of students</p> <ul style="list-style-type: none"><li>• Provide students opportunities to engage in hands-on science activities</li><li>• Expose students to science careers and role models</li></ul> 

# Broadening Participation for Undergraduates and K-12 Teachers

Jose Sanchez – Project Manager

	Research Experience for Undergraduates (REU)	Research Experience for Teachers (RET)	Internship
Description	10-week summer program for undergraduate STEM majors, includes \$5,000 stipend. (~12 students/yr)	6-week summer program for K-12 teachers, includes \$3600 stipend. (~10 teachers/yr)	Occurs each semester for high school and college students. Hourly rate \$10/hour for up to 10-20 hours per week. (~30 students/yr)
Goals	<p>Improve Researcher Identity and broaden participation of students in research</p> <ul style="list-style-type: none"><li>• Allow students to participate in scientific research</li><li>• Create a network for students</li></ul>	<p>Improve confidence in teaching science content</p> <ul style="list-style-type: none"><li>• Expose teachers to scientific research and collaboration with peers to inform their pedagogy</li></ul>	<p>Improve Researcher Identity and broaden participation of students in research</p> <ul style="list-style-type: none"><li>• Introduce students to scientific research</li></ul>



# Broadening Participation of Underrepresented Minority Groups over 5-year Grant Cycle

	Total Number (% URM)	N (%) African American	N(%) Hispanic	N(%) Female	N (%) Title I
<b>Internship</b>	157 (39%)	13(8%)	8(5%)	58(37%)	33(21%)
<b>RET</b>	51 (79%)	13(26%)	11(22%)	29(57%)	39(76%)
<b>REU</b>	115 (70%)	24(21%)	22(19%)	51(44%)	NA
<b>Summer Camps</b>	409 (81%)	83 (20%)	35 (9%)	289 (71%)	152 (37%)
<b>MSM</b>	72 (79%)	12 (17%)	9 (13%)	39 (54%)	42 (58%)
<b>K-12 Outreach</b>	30,098 students reached through 315 visits. 77% of schools were Title I				



# International and National Impact

- Our RET and REU participants come from across the nation.
- International and National Conferences
  - American Educational Research Association
  - National Association of Research in Science Teaching
  - National Science Teacher Association
  - USA Science and Engineering Festival (Washington, D.C.)
- Research Publications in International Peer-Reviewed Science Education Journals
  - Journal of Women and Minorities in Science and Engineering, Journal of Research in Science Teaching, International Journal of Gender, Science, and Technology, Research in Science Education
- **Broader impact is only possible because of our web presence and the Public Affairs team.**





# International Impact

Education webpage – 1,188,189 views since 2015

Country	Pageviews
USA	844,817
India	102,208
UK	68,395
Canada	56,546
Philippines	55,569
Australia	48,099
Turkey	19,229
Brazil	17,755
Germany	15,006
Malaysia	13,266
Spain	12,881



Magnet Academy – 4,108,099 views since 2015



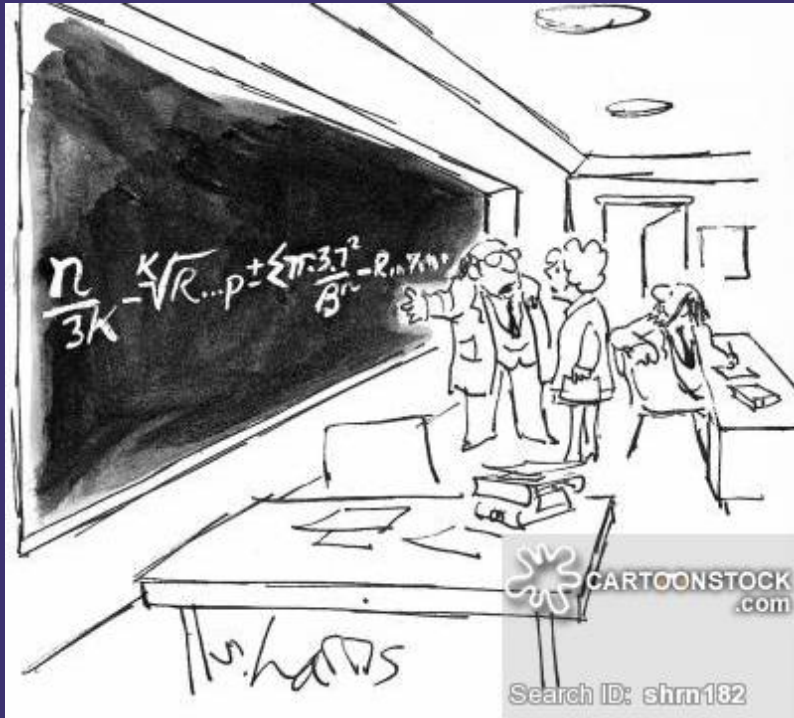
Country	Pageviews
USA	638,922
India	97,435
UK	65,647
Philippines	54,829
Canada	53,891
Australia	46,565
Turkey	18,417
Brazil	14,388
Germany	13,839
Malaysia	12,955
Pakistan	12,282

## Pageviews by Gender from 3/26/15-11/4/18

Pages	Male	Female
Education	427,636	315,903 (42%)
Magnet Academy	348,987	244,561 (41%)
K 12 students	16,894	25,564 (60%)
College students	11,830	9,087 (43%)
Teacher	8,338	10,417 (56%)
Mentoring moments	319	494 (61%)
All pages	814,004	606,026 (43%)







Public Affairs acts as the bridge between scientists and everyone else.

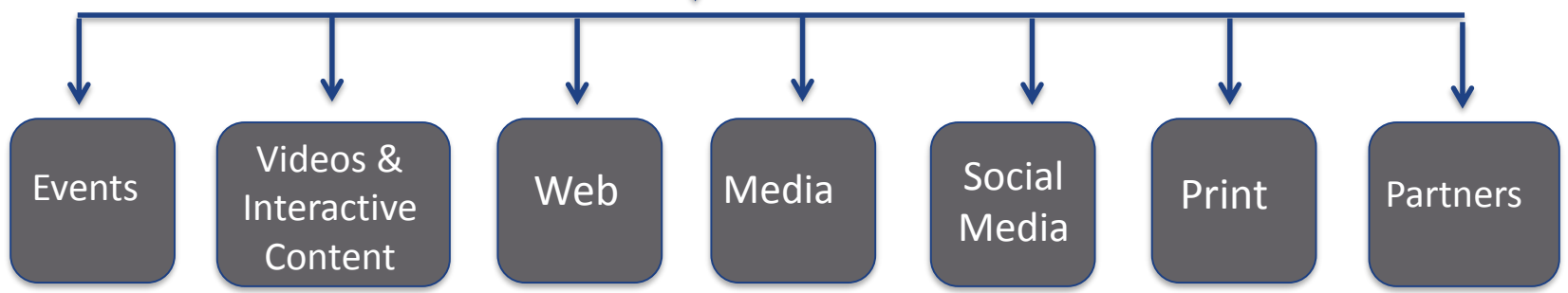
"BUT THIS IS THE SIMPLIFIED VERSION FOR THE GENERAL PUBLIC."





*Public Affairs acts as the bridge between scientists and everyone else.*

**TOOLS**



*Content designed for diverse audiences with varying levels of scientific comfort:*

**AUDIENCES**  
Worldwide & Local

- General public
- Users
- Industry
- Students
- Teachers
- Legislative/Gov't
- Scientists
- Universities
- Partners
- Internal

# OPEN HOUSE

*Every February, the MagLab invites the public to spend the day at our world-class research laboratory exploring about 100 hands-on demonstrations, taking self-guided tours and interacting with our expert scientists and staff.*

The 10,800+ Open House attendees span age, gender, ethnicity, race, income levels and geographic area.

A regional event with visitors traveling from

- Across Florida:
  - West Palm Beach
  - Fort Myers
  - Jacksonville
  - Panama City
  - Miami
  - Clearwater
- Georgia
- Alabama
- South Carolina
- Texas

About 30% of attendees report an annual family income of less than \$50,000



# OPEN HOUSE



Attract tons of people!

- Grow the event

Give visitors experiences that:

- Enrich their understanding of the MagLab
- Grow their respect & appreciation for the lab, our scientists, the research that takes place here and high magnetic field research in general
- Demonstrate that science is fun & important to people's lives

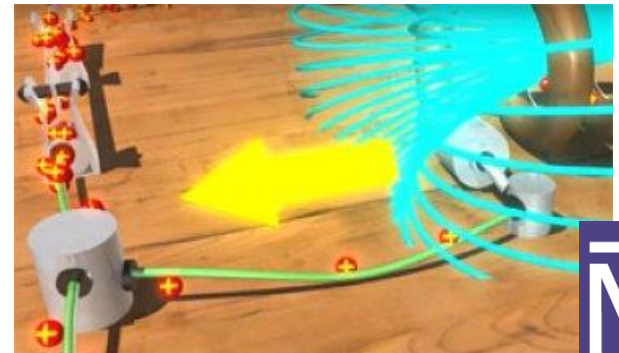
Increase post-event engagement

# See-Thru Science

*Seeing is believing. In these animations, we show viewers worldwide what electricity and magnetism might look like if they weren't invisible.*

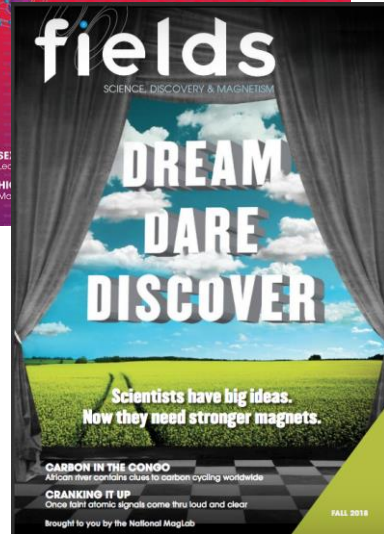
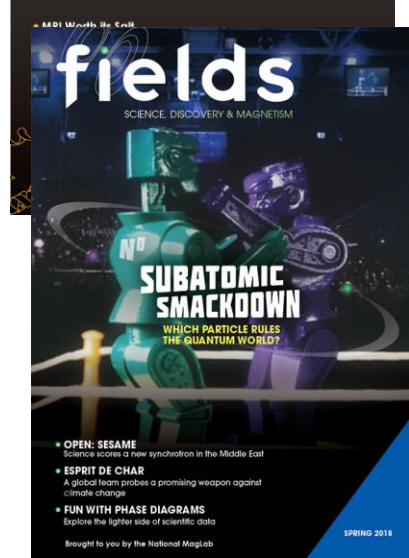
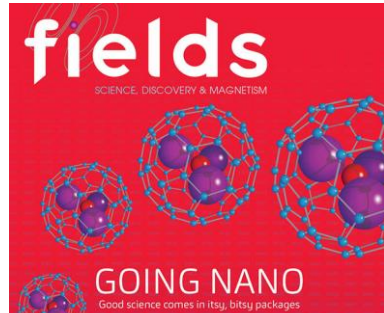
- How Capacitors Work
- How Electromotive Forces Work
- How Ignition Coils Work
- How Microwaves Work
- What Oersted Discovered with his Compass
- The Lorenz Force
- How Van de Graaff Generators Work
- How DC Motors Work
- How MRI Machines Work
- Right & Left Hand Rules

~3.4 million total views





# Fields Magazine



Reaches scientists and science fans to promote the value of high-field research across the globe.

- Launched in January 2017 - print and online format
- Biannual (Spring and Fall)
- Four issues published to date
- Distribute 7,000+ printed versions each issue
- Online has 12,000+ page views





# The Smackdown

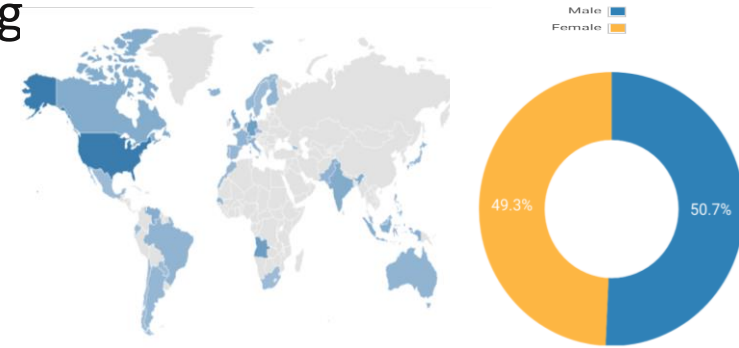
Millions of people were ready to rumble as four worthy particles took to the ring in one of the greatest science showdowns of all time.

- Articles for fields & symmetry magazines
  - 20,000+ people via print and online
- Staged as a performance
  - Sports-themed 2018 MagLab Open House for 8,000+ visitors
  - 2018 APS March Meeting - Press Event
  - Video – 2,300+ views



# The Smackdown

- Culminated in a very successful, weeklong audience engagement on social media:
  - **9.3 million+ impressions**
  - 600+ posts
  - ~530 people voted in poll to select the winner
  - Equal number of women and men participated in the Smackdown
  - Worldwide engagement
  - Participants ranged from scientists to teachers to science fans
    - Institutional participation from DOE, NSF, CERN, ORNL, Brookhaven National Lab, APS, Science Friday, SLAC, and Fermilab.

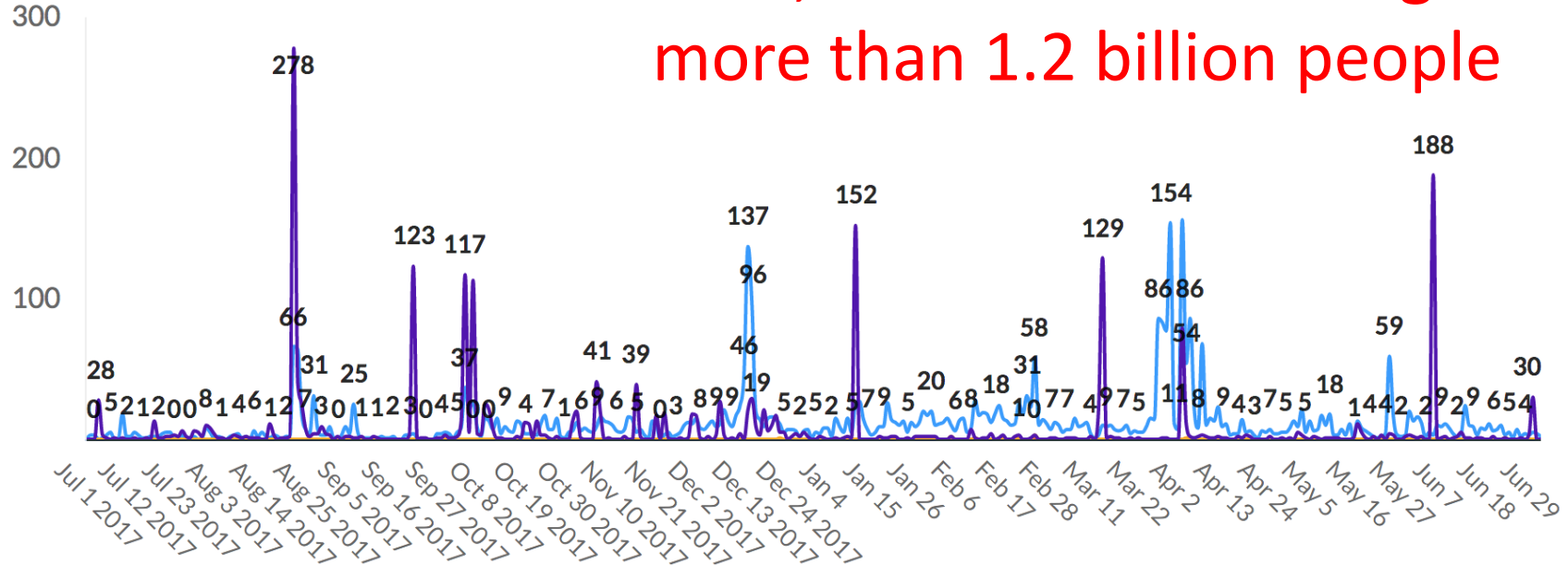


# MagLab in the News

## Media Exposure

July 1, 2017 – July 1, 2018

>2,200 articles reaching  
more than 1.2 billion people



Coverage in US News & World Report, The Washington Times, NY Daily News, CNBC, Popular Mechanics, The Huffington Post, Yahoo! News, ABC News, Los Angeles Times, Gizmodo en Español, CNET Japan & Business Insider

# MagLab on the Web

Website continued to grow in 2017: **1.1 million+** page views, a 13% increase

- Number of sessions - up 31%
- Number of users - up 41%
- Percentage of *new* users - up to 70% of all users

Social Media followers, fans, etc. also grew in 2017:

- **Facebook** - 26% growth
  - Even split between male (50%) and female (49%)
  - Most popular – ages 24 -44
- **Twitter** - 1,992 new followers
- **Instagram** - doubled in followers
- **LinkedIn** - added 250 followers
- **YouTube** – subscribers skyrocketed to 23,000+
  - 20+ times increase in views, watchtime and shares.



# Thank You!

Roxanne Hughes and Kristin Roberts

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[kroberts@magnet.fsu.edu](mailto:kroberts@magnet.fsu.edu)



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