BIG BANG SCIENCE FAIR
@WATERFIRE PROVIDENCE

Ulrich Heintz, Meenakshi Narain – Brown University
Connie Potter – CERN and the The Big Bang Collective
Chris Thomas – Iowa University and the The Big Bang Collective
WaterFire Providence

- WaterFire Providence® is an independent, ... non-profit arts organization whose mission is to inspire Providence and its visitors by revitalizing the urban experience, fostering community engagement and creatively transforming the city by presenting WaterFire for all to enjoy (from https://waterfire.org/).

- WaterFire is an award-winning sculpture by Barnaby Evans installed on the three rivers of downtown Providence. About 100 braziers light about a dozen times (usually Saturday nights) and attract about 1.1 million people to Providence each season.
The vision

• Promote Science for the public in collaboration with Art, Design and Music
• Take science to a large audiences who is not necessarily science-minded
• Promote appreciation of science as a normal part of everyday life rather than something reserved for an academic elite
• Target diverse audiences (girls and under represented minorities)
• WaterFire is an ideal venue to supply the audience
• Organize an evening full of fun and excitement
  • Lecture-demos by world renowned scientists
  • Hands-on science, art, and design activities
• Goal: establish the Big Bang Science Fair as an annual event!
The people

- Main organizers: Meenakshi Narain (Brown U, CMS) & Connie Potter (CERN, ATLAS)
- Plus
  - Carlos Aizenman (Brown University)
  - Geeta Chougule (Brown University)
  - Gelonia Dent (Brown University)
  - James S. Gates (Brown University)
  - Geoffrey Gunter (Citizens Bank)
  - Ulrich Heintz (Brown University)
  - Stephanie Mott (Bryant University)
  - List of organizers: https://www.brown.edu/academics/physics/event-organizers
- 180 Volunteers
  - from Brown University, U Mass Amherst, local high schools, neighbors, friends and family ...
The sponsors

• Nothing happens without funding…

THANK YOU FOR YOUR GENEROUS SUPPORT

https://www.brown.edu/academics/physics/sponsors
The branding

• We needed a name
  • Science lighting?
  • The Universe at the Micro-Macro Scales?
• Then we needed a logo
  • which didn’t conflict with the WaterFire trademark
The program

- September 22, 2018, from 3 – 11pm
- Presentations
  - 6 lecture presentations in RISD auditorium
- Workshops in big tent on market square
  - Theremin
  - Cloud Chamber workshops
  - CS
    - bb8 droids,
    - Zombie, arduino coding
    - Game design using Scratch
- Hands-on-activities all over market square
  - Telescopes
  - Neuroscience
  - RI Museum of Science and Arts
  - Chemistry
  - CS4RI
  - Neutrinooscope
  - Science of Cooking
  - Physics demos
The signage

• Every tent was named after a famous female scientist

**Table of Optics**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00-9:10 AM</td>
<td>Flight Tube</td>
</tr>
<tr>
<td>9:10-9:20 AM</td>
<td>Light Pendulum Exhibit</td>
</tr>
</tbody>
</table>

**Table of Fluids**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:10-9:20 AM</td>
<td>Shadow and Light</td>
</tr>
<tr>
<td>9:20-9:30 AM</td>
<td>Light Pendulum Exhibit</td>
</tr>
</tbody>
</table>

**Table of Materials**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30-9:40 AM</td>
<td>STEAM Table Top Activities</td>
</tr>
</tbody>
</table>

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**About Marie Curie**

Marie Curie is often called the first woman to win a Nobel Prize (1903), but also the first to win a Nobel Prize in a second subject (1911). She was the first person to win two Nobel Prizes in different fields. In 1903, she shared the Nobel Prize in Physics with her husband Pierre and Becquerel for their work on radioactivity. In 1911, she became the first woman to win a Nobel Prize in Chemistry for her work on radium and polonium.

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**About Maria G. Mayer**

Maria G. Mayer was a physicist and mathematician. She received her Ph.D. from the University of California, Berkeley, and later became a professor at MIT. She is known for her work on the behavior of semiconductors and the development of new materials for electronic devices.

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**About Rita Levi Montalcini**

Rita Levi Montalcini was a neurobiologist and a pioneer in the field of neurodevelopment. She is best known for her work on the role of nerve growth factor (NGF) in the development of the nervous system. Her research led to the discovery of new targets for cancer treatments.

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**About Ada Yonath**

Ada Yonath is a structural biologist and a Nobel laureate. She is known for her work on the structure of the ribosome, a complex molecular machine that translates genetic instructions into proteins.

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**About Frances E. Allen**

Frances E. Allen is a computer scientist and a pioneer in the field of computer architecture. She is known for her work on parallel computing and the design of efficient algorithms.

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Will people sit in an auditorium for 30 min lectures?
Will people sit in an auditorium for 30 min lectures?

Yes, they will!
The workshops – 1 hour-ling in depth activities

Hands off! How to play the Theremin
With Dorit Chrysler

Talk to your BB8 droid

See cosmic rain with cloud chambers

Defeat Zombies/Java and Raspberry Pi

Game Design with Scratch
Colors: Brown/Blue/Red/White/Black
[Age 10 to 12 to be accompanied by an adult]
B Sarah Giesbrecht (a junior student) to create interactive storylines, animations, games, music and art, with their concepts in story with the Scratch programming environment.

Talk to your BB8 Droid
Colors: Brown/Blue/Red/White/Black
[Age 10 to 12 to be accompanied by an adult]
Join BB8 in a 45 minute session, the BB8 droid will answer your questions, and tell you about his adventures!

Defeat the Zombies with Java and Raspberry Pi
Colors: Brown/Blue/Red/White/Black
[Age 10 to 12 to be accompanied by an adult]
Join BB8 in a 45 minute session, the BB8 droid will answer your questions, and tell you about his adventures!

“HANDS OFF”—How to Play a Theremin
Colors: Brown/Blue/Red/White/Black
[Age 10 to 12 to be accompanied by an adult]
Join BB8 in a 45 minute session, the BB8 droid will answer your questions, and tell you about his adventures!

Use Cloud Chambers to See the “Cosmic Rain”
Colors: Brown/Blue/Red/White/Black
[Age 10 to 12 to be accompanied by an adult]
Join BB8 in a 45 minute session, the BB8 droid will answer your questions, and tell you about his adventures!

BIG BANG SCIENCE FAIR
Tickets available at the door 30 minutes prior to each event.

WORKSHOPS@THE LAB in Market Square

Chat with the droid, and create a storyline for the droid.

7/30/2019 Heintz - DPF 2019
Take a selfie with the Large Hadron Collider

**What is the LHC?**

"LHC" stands for Large Hadron Collider. Let’s break down these three words so you can understand what’s going on:

1. The LHC is an underground tunnel 27 km (16.8 mi) around.
2. "Hadron" is a term for a class of particles that include the proton.
3. The LHC collides protons from countering beams in the tunnel.

The Large Hadron Collider is the largest experimental apparatus in the world. It is located deep underground on the border of France and Switzerland.

**How was the LHC built?**

The LHC resides in the tunnel of a former particle collider known as the Large Electron-Positron Collider. Construction of the LHC began in 1995 and it had its first collisions in 2008. The construction of this project required thousands of scientists, engineers, and technicians, and a $10 billion budget.

**How are the protons made to collide?**

The main component of the Large Hadron Collider is the magnet system which is contained inside the tunnel. The magnets direct and focus the beams. However, the protons are accelerated by a fluctuating electric field. This system requires precise alignment to ensure that the particles actually collide and not just fly by one another.

**Who works at the Large Hadron Collider?**

Scientists from all over the world work at the Large Hadron Collider, and many more work remotely from their home institutions—like the physicists at Brown University! In fact, it takes thousands of scientists to operate the collider and the four different detectors located around the ring. In total, over 11,000 scientists are involved with projects at CERN, representing over 100 different countries...one day it could be you!

**Want to know more?**

Please feel free to ask one of our scientists wearing an “Ask a Scientist” button about the Large Hadron Collider. We will do our best to answer all your questions!
Sidewalk astronomers
Fun and Excitement for all ages
The audience

• Attended by 4000+ people.
  • We counted attendance by giving out stickers and stopped counting after 4000
• Time lapse video [https://youtu.be/Tdqe5oCwLPM](https://youtu.be/Tdqe5oCwLPM)
The maze

We saw this at the National Museum of Math in New York City and we loved it. Step over the balloons in the order red, white, blue, red, white, blue, ... Can you find the exit?
Feedback collection

- We gave out feedback forms at the workshops and at the RISD auditorium

- Almost all forms checked
  - Yes – enjoyed the presentations
  - Level just right

- Only a few forms had comments
  - Mostly from RISD lectures
  - All comments were positive
  - Is there a better way to do this?

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Feedback Form  Presentations @RISD Auditorium  
BIG BANG SCIENCE FAIR at WaterFire Providence, Sep 22, 2018

We want to hear your thoughts about your experience; good or bad. Thanks!

Title of Presentation

- Did you enjoy the presentations?  YES ✓ NO
- Was the duration and level of the talk/activity?
  Just right [✓]  Too complicated/too long [ ]  I didn’t understand anything [ ]
- Could you please indicate your age range (in years)?
  5-10  11-15  16-18  19-24  25-39  40-64  65 +
- E-mail (optional)
- Any comments or suggestions you’d like to give us please include here...
Outlook

• The First Big Bang Science Fair at WaterFire Providence on Sept 22, 2018 was a success
• Our goal is to make this an annual event
• Funding for 2019 is already in place and planning is advanced
  • Saturday Sep 28th
  • On Market Square
    • Neuro/Brain Science, Chemistry, RIMOSA, Science of Cooking, Physics, CS, Virtual Reality (Zspace.com)/RIVR, SkillsForRI partnership
  • In RISD Auditorium
    • Women’s Leadership panel discussion
    • Prof. John Donoghue: “Merging Man and Machine to help people with Paralysis”
    • Prof. Stephon Alexander, Melvin Gibbs et al. “Cosmic Zones” A jazz performance
    • And many more to be confirmed
• Planning for 2020 will start in fall…
More information on Website and Facebook

• Facebook
  • https://www.facebook.com/Big-Bang-Science-Fair-Providence-793571531043146

• Website
  • 2019 website will be launched soon

• Providence Journal Article:
  • https://www.providencejournal.com/news/20180922/by-light-of-waterfire-beauty-of-science-shines?fbclid=IwAR3o2st38W2ot0X2G_S1hcBDAI8MTgU4_oBdxUcdyxpp2QnkJN9j0pYgZOI

• YouTube
  • https://youtu.be/iOIEr3_bzaY
  • https://vimeo.com/293561594
  • https://www.youtube.com/watch?v=Tdqe5oCwLPM

• Blog