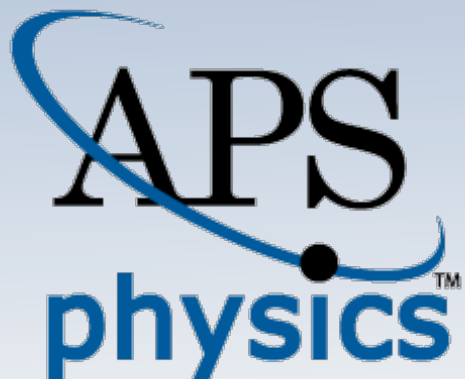


Physics & Engineering

in Harmony from Research to Development

Amandeep Gill - Public Outreach Intern

Mentors: James Roche and Rebecca Thompson



SOCIETY OF PHYSICS STUDENTS
An organization of the American Institute of Physics

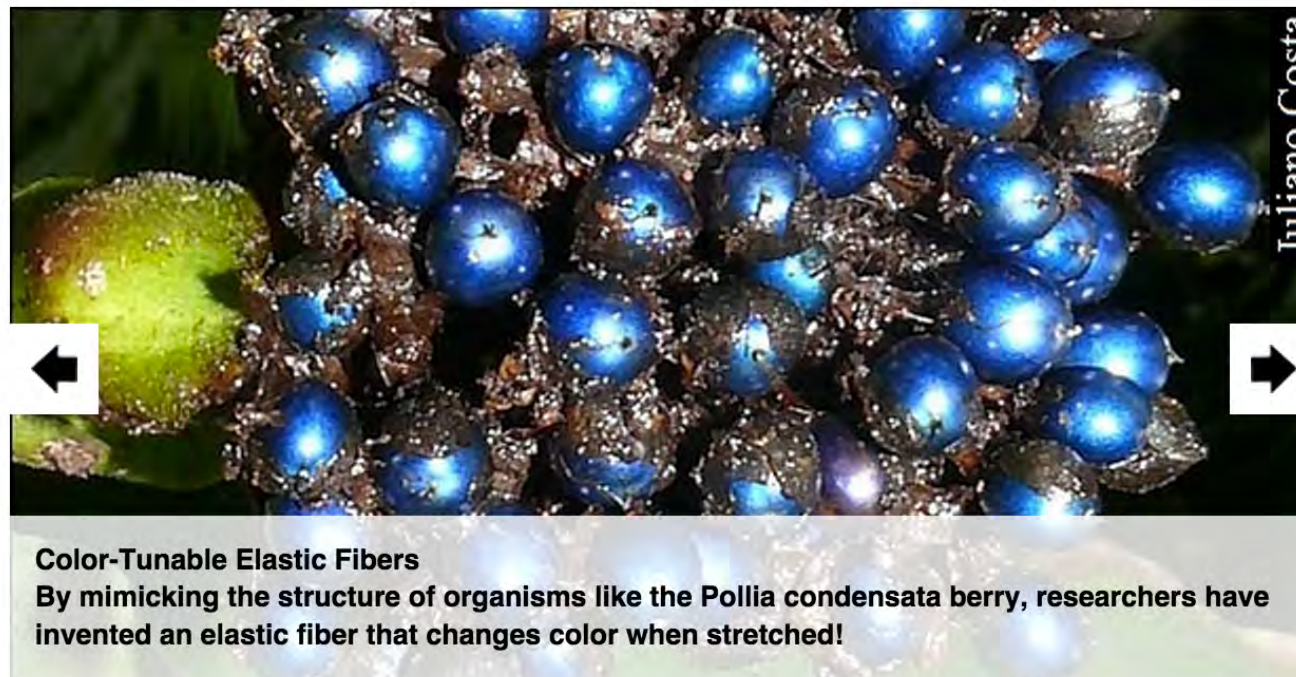
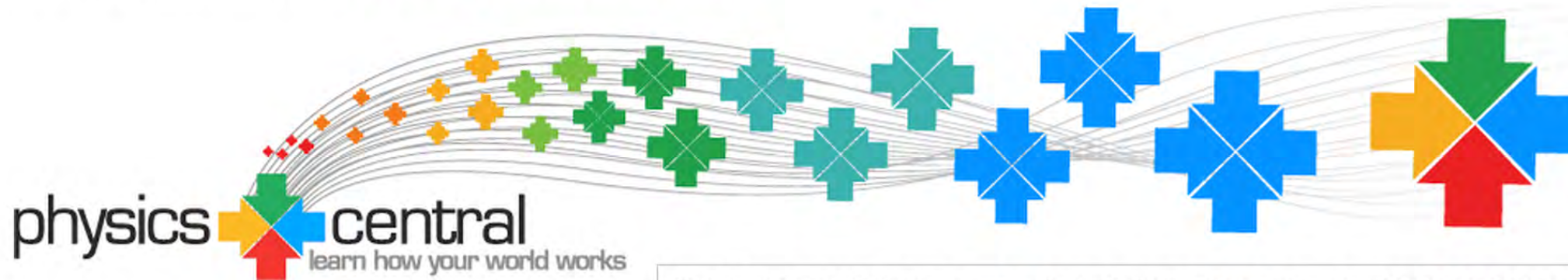


Outline

- ➔ Motivation
- ➔ Learning Kivy
- ➔ App Content & Design
- ➔ Experience
- ➔ Acknowledgments

- Freedom to choose my own project
- The relation between Physics and Engineering
- Current APS outreach activities





Physics Buzz Blog

[How Insects' Legs Can Improve Man-Made Materials](#)

Thursday, July 30, 2015

In an effort to improve materials used in aviation and medicine, a team of Irish researchers is studying the legs of certain insects. Some features that appear to contribute to the legs' sturdiness don't actually do so, they found, while others that woul... [more](#)

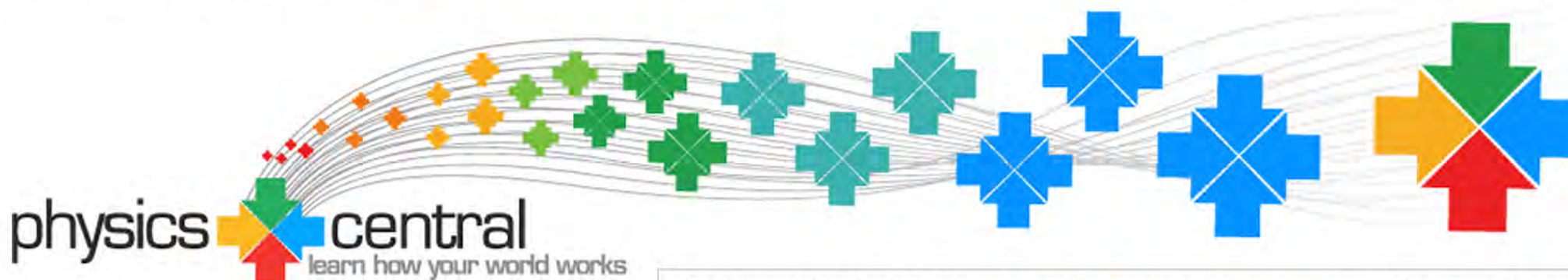
[Paranormal \(AC\)tivity](#)

Wednesday, July 29, 2015

Engineering designer Vic Tandy had just seen a ghost. That, or he was losing his mind, he thought. Image Credit: Mark Strozler, Creative Commons by-nc-nd It happened the way these things often do; he was alone in the laboratory, after dark. It was a ... [more](#)

discover





Explore the Science • [Ask & Experiment](#) • Physics Buzz

Ask & Experiment

[PhysicsQuest](#)

[Physics@Home](#)

[Ask-a-Physicist](#)

[Activity Books](#)

[Video Contests](#)

[Einstein@Home](#)

[Adopt-a-Physicist](#)

Discover



PhysicsQuest

PhysicsQuest is a story-based activity that exposes middle school students to the fun and relevance of science. APS provides a free PhysicsQuest kit to registered 6-9th grade physical science classes, home school groups, science clubs, and after-school programs. The kit includes a user's manual and materials for four physics experiments.

PhysicsQuest: Spectra's High Intensity



I hope you are having a great time doing the activities for Spectra's High Intensity. If you are done with PhysicsQuest: Spectra's High Intensity, you can [submit your answers here](#). You do not have to have completed all the activities to submit your answer, If you've only had time for a few or even only one activity you can still submit the answers you have and be eligible to win fabulous prizes!

Download Spectra 7, Spectra's High Intensity [here](#)! Read about her latest tussle with Miss Alignment. If you would like to download the teacher's manual, including the activities, click [here](#).

Miss Alignment has broken out of jail and is on the loose hatching evil plans. Armed with a high IQ, an inferiority complex, and a secret lair, she will try yet again to control the town. Your students can help Spectra, her gang, and her new friend the Quantum Mechanic stop Miss Alignment's focus on evil.

In celebration of the [International Year of Light](#), this kit will have all of the equipment needed to teach students about bending light, spherical lenses, how color and energy are related, and how the sun's light also carries heat. As the students do these activities, they will be applying all the skills they need to help our superheroes prevent Miss Alignment's attempted

Explore this Section

[PhysicsQuest](#)

[About PhysicsQuest](#)

[Past PhysicsQuest Projects](#)

[Spectra: Turbulent Times \(2013\)](#)

[Spectra's Quantum Leap \(2014\)](#)

[Spectra Heats Up! \(2011\)](#)

[Spectra's Force \(2010\)](#)

[Solutions and Winners \(2010\)](#)

[Spectra: The Original Laser Superhero & Spectra's Power \(2009\)](#)

[Solutions and Winners \(2009\)](#)

[Nikola Tesla and the Electric Fair \(2008\)](#)

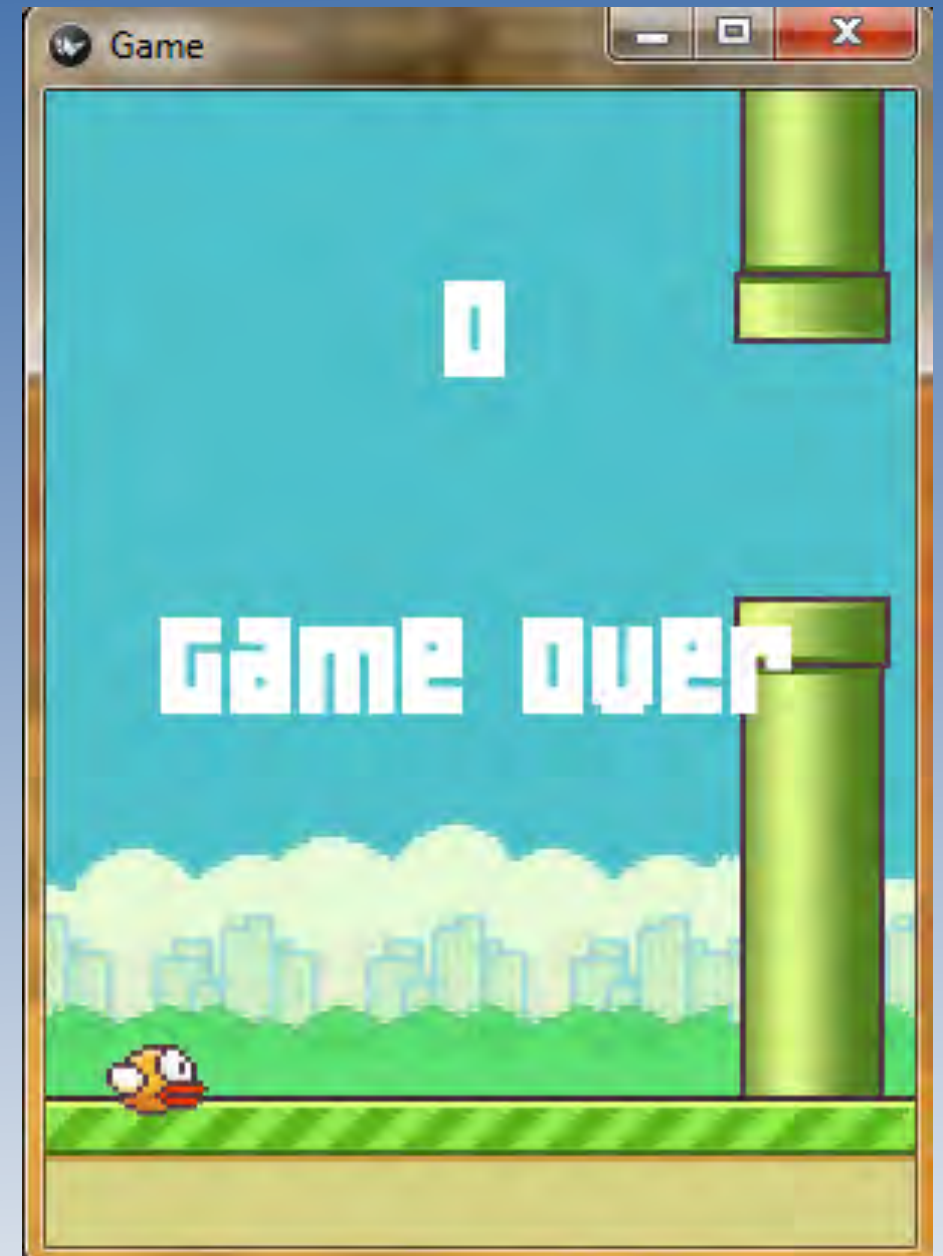
[Solutions and Winners \(2008\)](#)

[Marie Curie's Floating Classes \(2007\)](#)

[Solutions and Winners](#)

Learning Kivy

- Library for game design
- Python
 - high-level language
 - lots of uses
- Flappy Bird game tutorial



Python

```
1 from kivy.app import App
2 from kivy.uix.screenmanager import ScreenManager, Screen
3
4 class WelcomeScreen(Screen):
5     pass
6
7 class MenuScreen(Screen):
8     pass
9
10 class PeopleScreen(Screen):
11     pass
12
13 class BarryScreen(Screen):
14     pass
15
16 class JanchesScreen(Screen):
17     pass
18
19 class JacksonScreen(Screen):
20     pass
21
22 class HubbleScreen(Screen):
23     pass
24
25 class SpaceScreen(Screen):
26     pass
27
28 class CommunicationsScreen(Screen):
29     pass
30
31 class TransportationScreen(Screen):
32     pass
33
34 class AcknowledgmentScreen(Screen):
35     pass
36
37
38
39 class Explore2App(App):
40
41     screen_manager = None
42
43     def build(self):
44         sm = ScreenManager()
45         sm.add_widget(WelcomeScreen(name='welcome'))
46         sm.add_widget(MenuScreen(name='menu'))
47         sm.add_widget(PeopleScreen(name='people'))
48         sm.add_widget(BarryScreen(name='barry'))
49         sm.add_widget(JanchesScreen(name='janches'))
50         sm.add_widget(JacksonScreen(name='jackson'))
51         sm.add_widget(HubbleScreen(name='hubble'))
52         sm.add_widget(CommunicationsScreen(name='comm'))
53         sm.add_widget(SpaceScreen(name='space'))
54         sm.add_widget(TransportationScreen(name='trans'))
55         sm.add_widget(AcknowledgmentScreen(name='ack'))
56
57         return sm
58
59
60 if name == 'main':
```

Kivy

```
1 #:import SwapTransition kivy.uix.screenmanager.SwapTransition
2
3 <WelcomeScreen>:
4     orientation: 'vertical'
5     button_font_size: '30sp'
6     padding: root.width * 0.02, root.width * 0.02
7
8     canvas:
9         Rectangle:
10             source: 'images/blue.jpg'
11             pos: self.pos
12             size: self.size
13         Rectangle:
14             source: 'images/engphys.png'
15             pos: root.width*.41, root.height*.71
16             size: 150, 150
17
18     FloatLayout:
19         Label:
20             text: '[b]Physics & Engineering[/b]'
21             markup: True
22             font_size: '72sp'
23             text_size: self.size
24             pos: root.width*.001, root.height*.52
25             size_hint: 1, 2
26             halign: 'center'
27         Label:
28             text: 'In harmony from\nresearch to development.'
29             font_size: '50sp'
30             text_size: self.size
31             pos: root.width*.001, root.height*.27
32             size_hint: 1, 2
33             halign: 'center'
34         Button:
35             text: 'Explore!'
36             background_color: (0, 0, 0, .5)
37             font_size: '65sp'
38             pos: root.width*.3, root.height*.03
39             size_hint: .4, .2
40             height: self.texture_size[1] + (3 * root.padding[1])
41             on_press: root.manager.current = 'menu'
42
43 <MenuScreen>:
44     orientation: 'vertical'
45     button_font_size: '30sp'
46     padding: root.width * 0.02, root.width * 0.02
47     canvas:
48         Rectangle:
49             source: 'images/hubble.jpg'
50             pos: self.pos
51             size: self.size
52     FloatLayout:
53         Label:
54             text: 'Learn how physics and engineering work in harmony from research to development for many modern
55                 technologies. Select a topic to explore!'
56             font_size: '35sp'
57             text_size: self.size
58             pos: root.width*.001, root.height*.75
59             size_hint: 1, 2
```

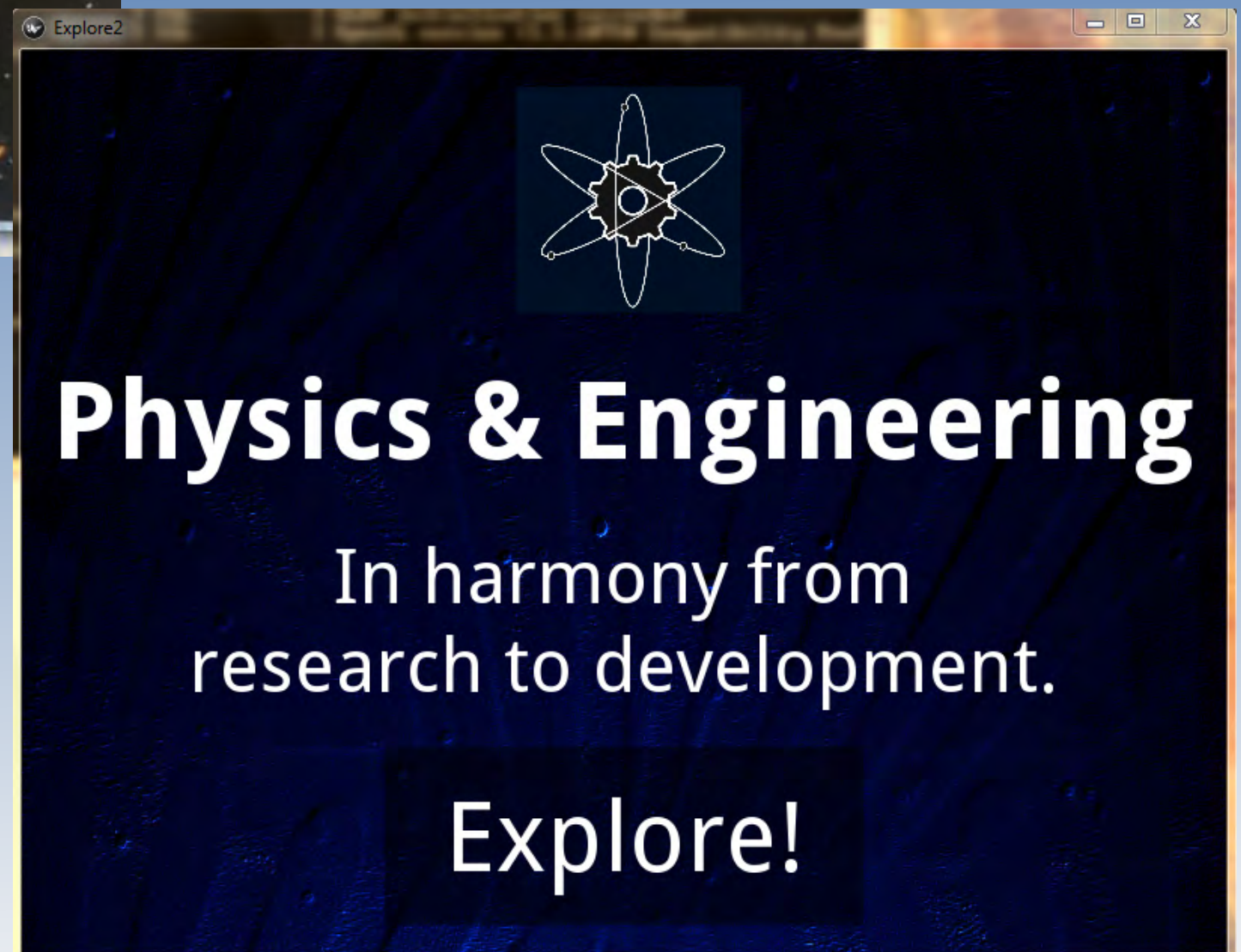
App Content & Design

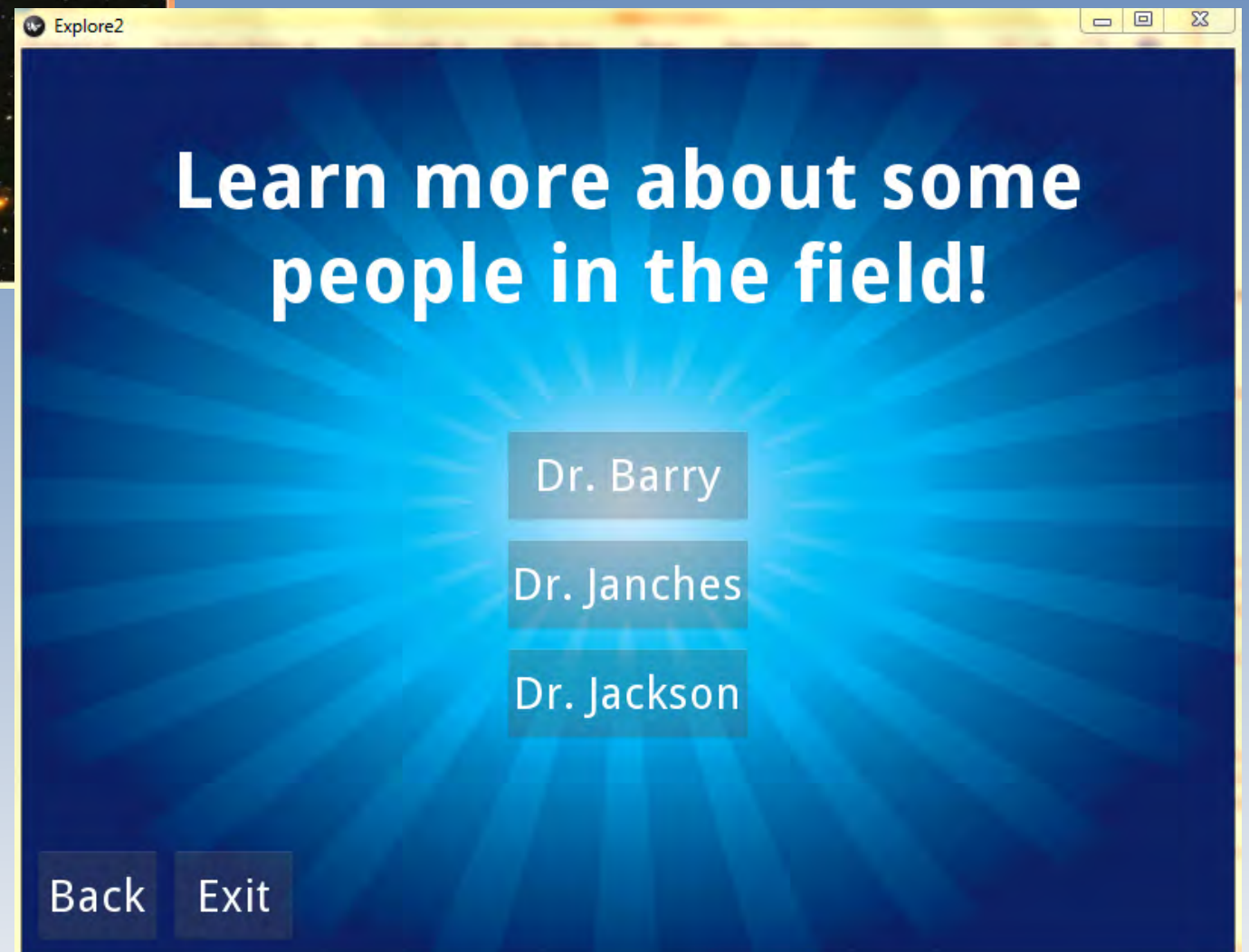
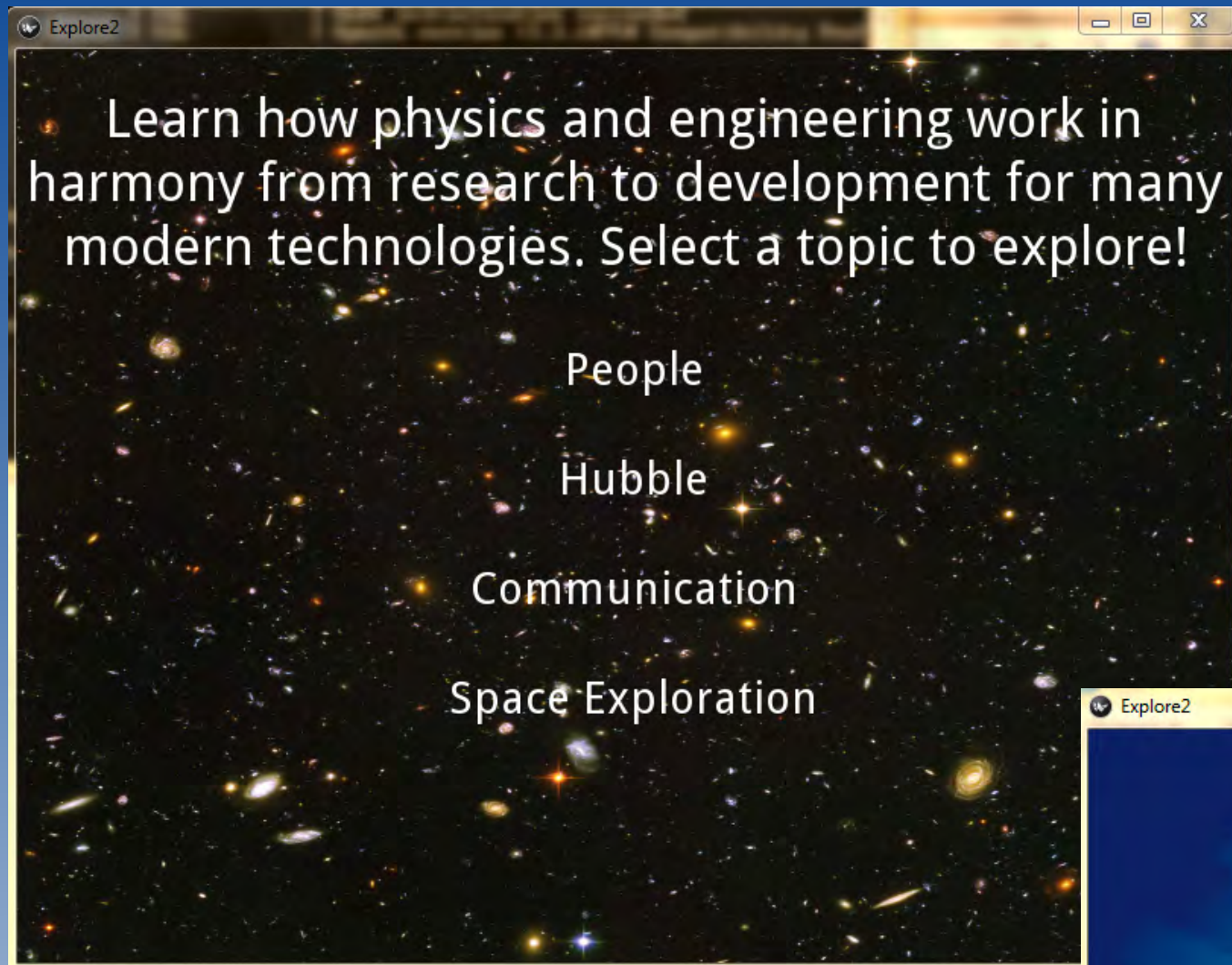
Content:

- Selected topics
- Interviews with people from both fields
- Target audience

Design:

- Several iterations
- Adaptable
- Difficulties
 - text size
 - text location
 - button location







Communication Satellites

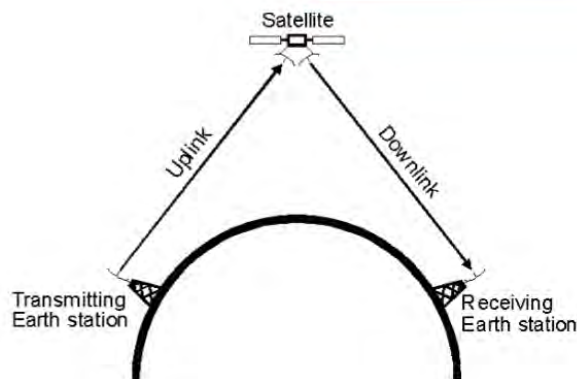


Engineering

Satellites enable fast communication across large distances over land and ocean without the extensive cabling of days gone. Using advancements made in engineering, communication satellites are able to be manufactured smaller, lighter. Making them cheaper to launch.

Communication satellites are just antennas in space. They both receive and transmit data. The physics of antennas is based off the resonating element. The size, shape, material, and direction of the antenna depend upon what frequencies it needs to receive and send.

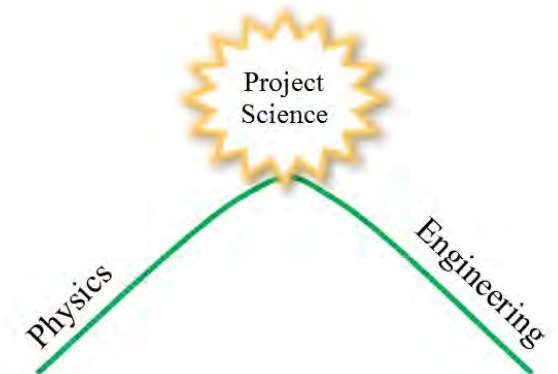
Physics



Dr. Richard Barry

ASTROPHYSICIST

Dr. Barry started off his academic career with a bachelors and masters in Electrical Engineering. Working as an engineer, he realized he was very interested in the science, so he went on to earn another masters in Physics and Astronomy, as well as a Ph.D.



What is the relation between Physics and Engineering?

Physics and Engineering are parts of a curve (as seen above), the cusp of which is project science, a field that combines knowledge and skills of the two subjects.

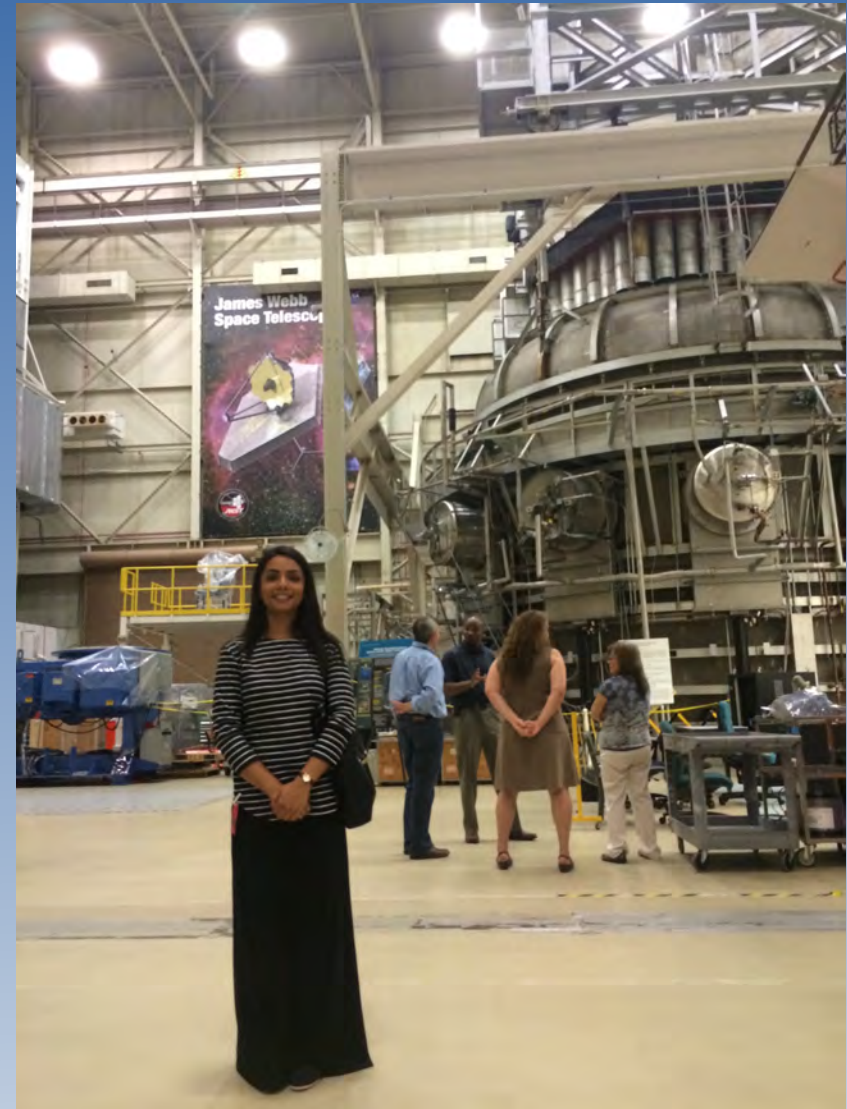
Dr. Barry is currently working on micro-lensing and transit spectra techniques to observe exoplanets and their atmospheres.

He has experience with both sides of the curve and works at the project science cusp to promote and facilitate better team communication.



Experience

- Living in DC
- Touring labs
- Interviews
- Working at APS
- Providing input for AIP programs
- Outreach at a national level



Acknowledgments

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Daniel Golombek
Sacha Purnell
Lydia Quijada
Matthew Payne