Omitted History

Education and Outreach Avenues in the History of Physics

Maria Stokes | 2020 SPS Internship

AIP | American Institute of Physics

Center for History of Physics &
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Motivation

Moses Rifkin, "Addressing Underrepresentation: Physics Teaching for All”

> When we teach physics, we talk about physicists. Newton, Maxwell, Lenz, and Einstein: we take time in our classes to name (and sometimes discuss) who has done the physics that we are teaching... Whether we realize it or not, most of us implicitly communicate to students that scientists come from one demographic group...But there is a richer history of physics among other groups than shared by traditional presentations of physics.

Citation: The Physics Teacher 54, 72 (2016)

Introduction:

Center for History of Physics (CHP) Teaching Guides

- Highlight the contributions of individuals from underrepresented groups in physics
- 5 Es Teaching Model

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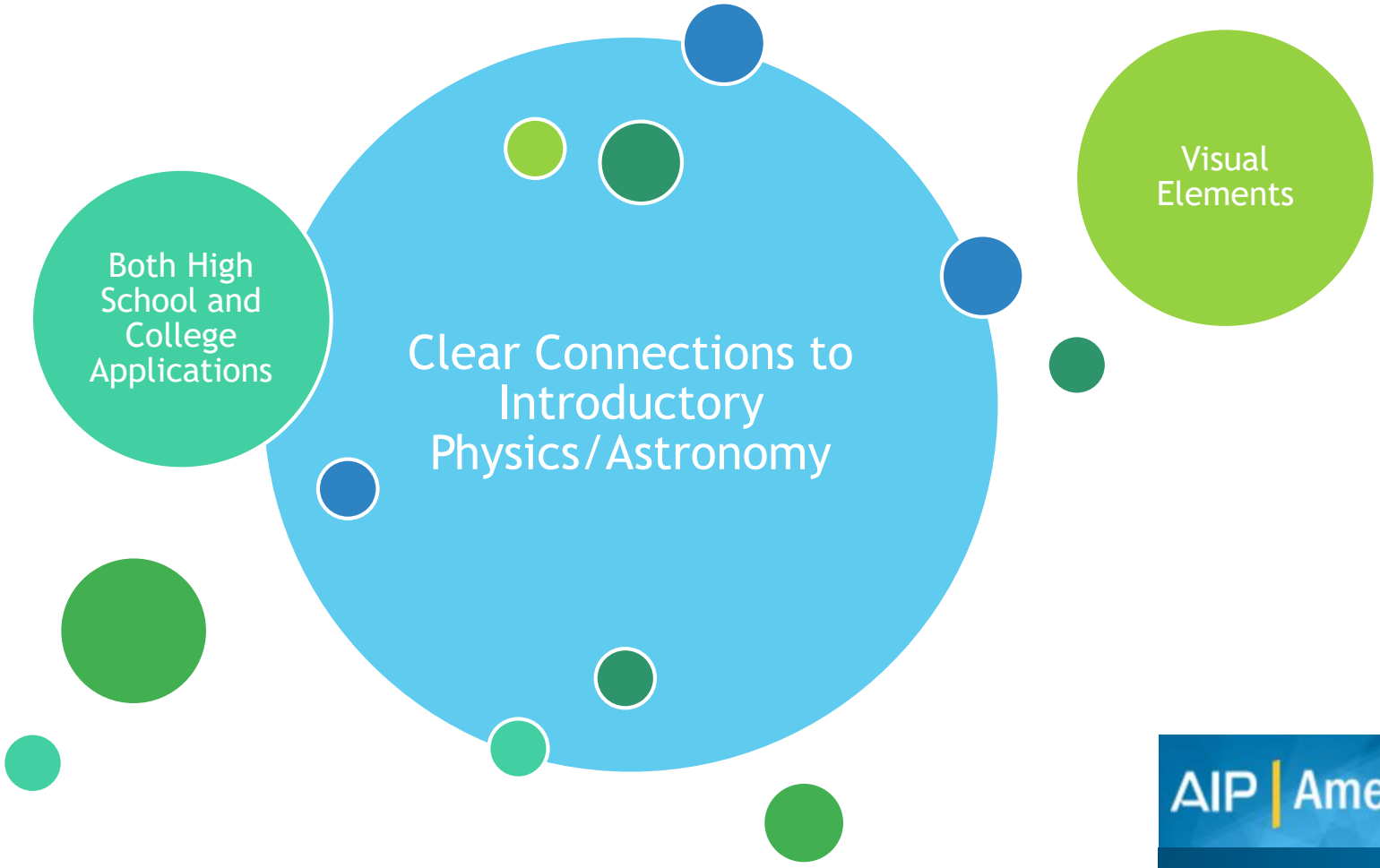
Approach



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3 New Teaching Guides

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On the Shoulders of Giants

- The Law of Inertia
- The Islamic Golden Age

The Heritage of All Mankind

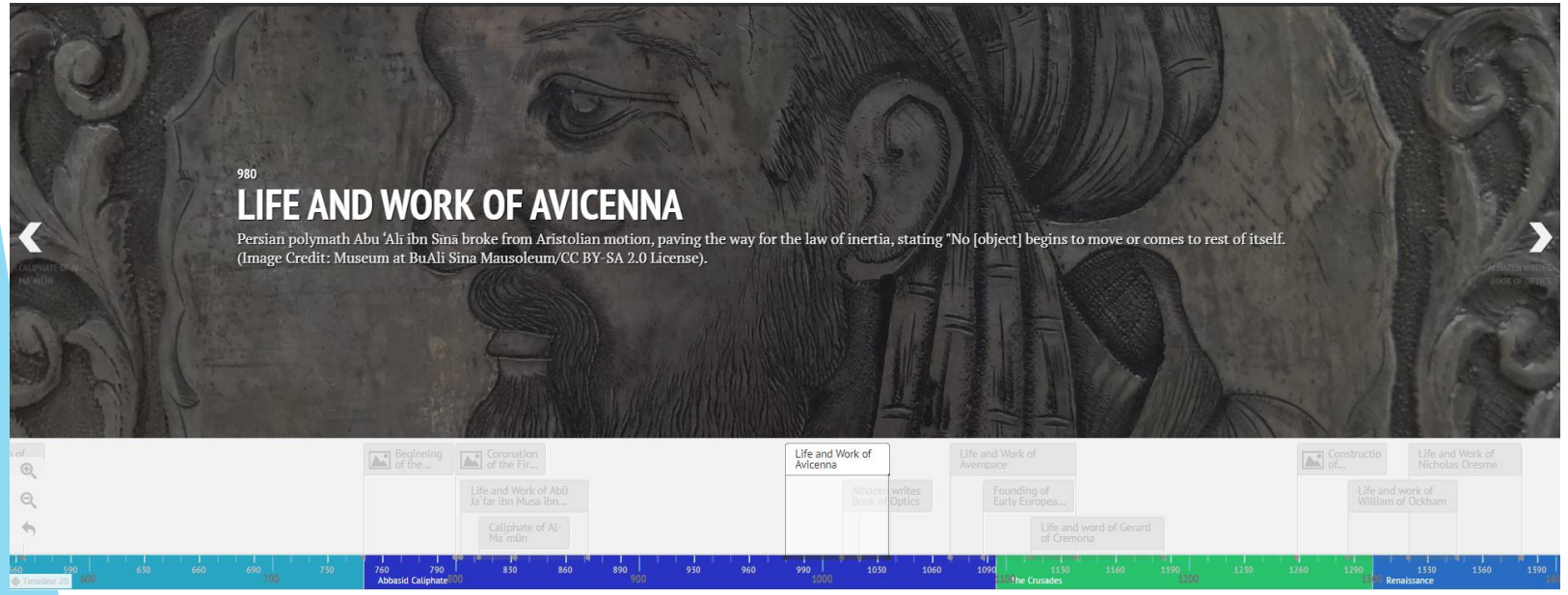
- The Four Fundamental Forces
- Dr. Abdus Salam

Making Waves

- Multiwavelength Astronomy
- Dr. France Córdova

Highlight: History Inclusions

- Recorded Biographical Presentations
- Visual Timeline
- Reading Handouts and Discussion Questions
- Oral History Inclusion



Left: One event in the interactive timeline, "On the Shoulders of Giants: From the Islamic Golden Age to Newton's Three Laws of Motion." Ibn Sīnā (Avicenna), pictured, wrote a precursor to the law of inertia.

Above: Biographical Presentation on Abdus Salam. Accessible at CHP's YouTube Channel.

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Highlight: Physics Content

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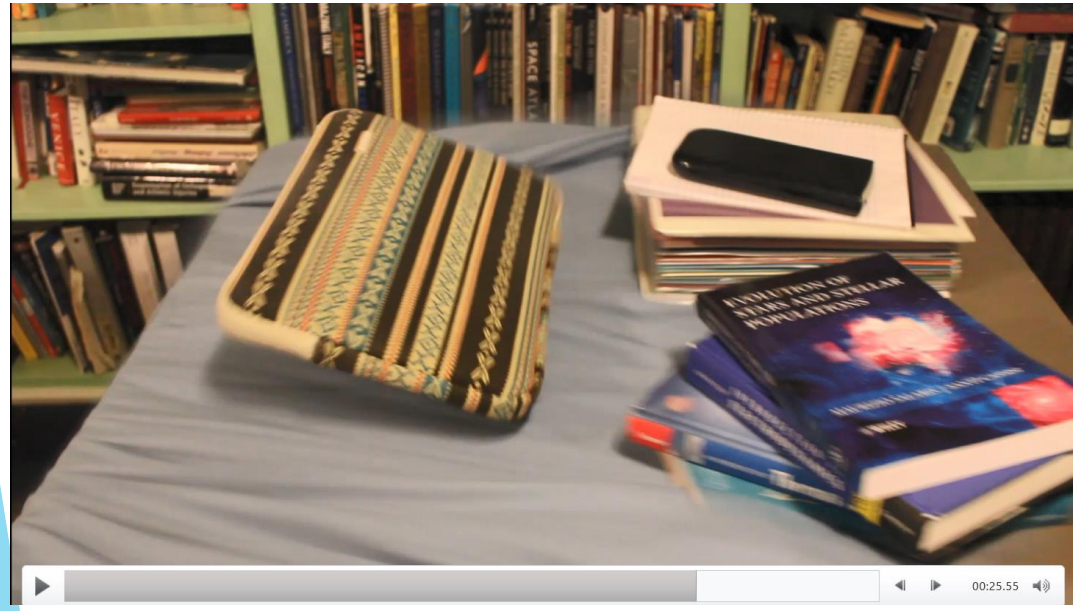
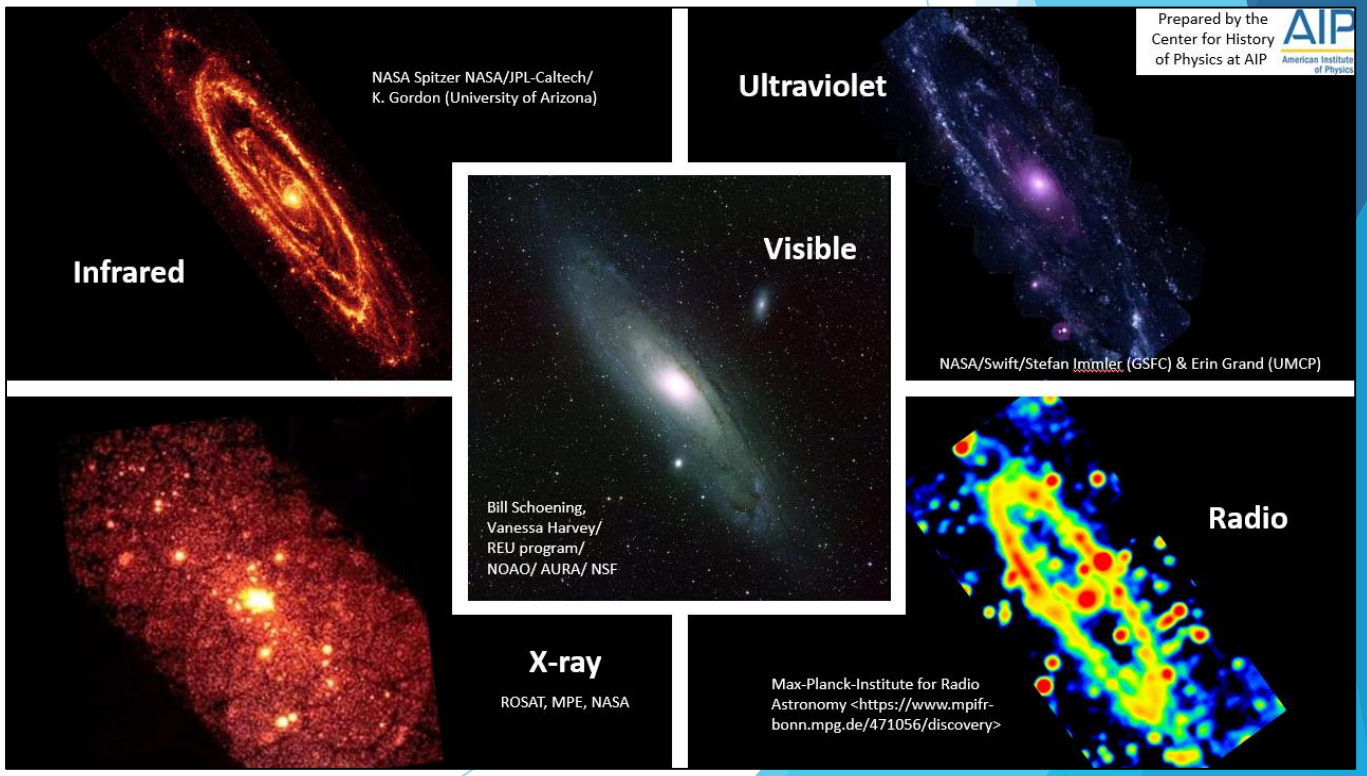
- Possible Lecture Outlines
- Demo Video
- Visuals



Above: Frame from inertia demonstration video, accessible on the SPS YouTube Channel.

Below: The Andromeda Galaxy in 5 subsets of the electromagnetic spectrum, designed for CHP "Making Waves" teaching guide. All images are credited in the poster.



Outreach

- Developed material for online presence
- Niels Bohr Library & Archives (NBLA) and CHP blog

1. A Visual Walk Through the Fundamentals
2. Unifying
3. Complements to Physics
4. Breaking the Barrier
5. Before Newton

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Highlight: Science Communication

- Introduces the fundamental forces.
- Incorporates images from the Emilio Segrè Visual Archives
- Tells a narratives, focusing on unifications

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Screenshot and images from blog post. Visit Ex Libris Universum for more information and full post.

Ex Libris Universum

August 4, 2020

A Visual Walk Through the Fundamentals

Maria Stokes, SPS Intern

PHYSICS HISTORY | EMILIO SEGRÈ VISUAL ARCHIVES |

The process of discovering the unity of forces in physics is central to the history of physics. Here the story of unification is presented using images from the Emilio Segrè Visual Archives (ESVA). It is not always chronological and it is not yet complete. Nevertheless, there are many converging pieces from all over the globe, and universe, in the story of unification.

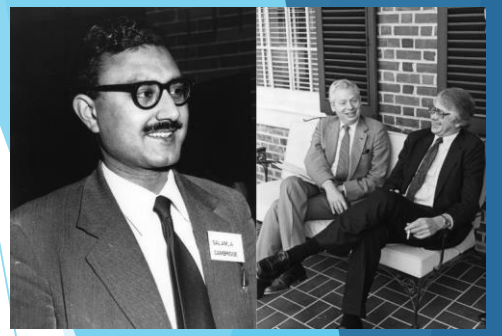
The structure for this story comes from a simple classification. Introductory courses in physics present four fundamentals forces that govern nature: gravity, electromagnetism, and the strong and weak nuclear forces.

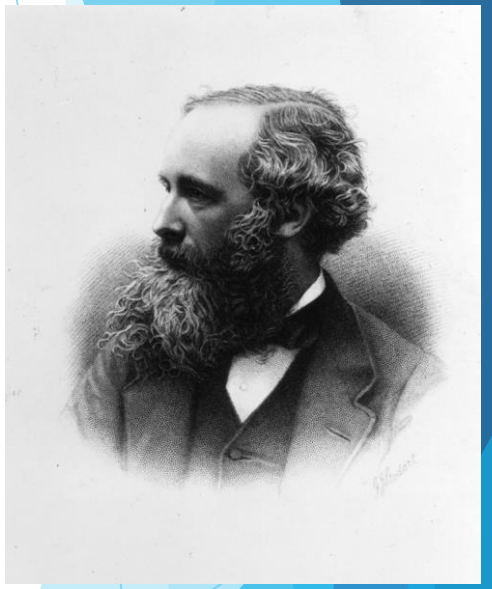
Gravity

Gravity is something we are all familiar with. We think of Newton and his apple tree, pictured to the right. In reality, the story is even more fascinating. Many starting points in the history of gravitation can be identified. One is with Aristotle. He thought that objects tend towards the center of the earth based on their heaviness. Brahmagupta, a scholar working in seventh century India, recognized that gravity is an attractive force [1]. In the Islamic Golden Age (beginning around the eighth century), scholars of Aristotle himself broke from Aristotelian conceptions of the universe. Historian of science Jim Al-Khalili notes that Al-Baghdādī, a scholar in the Islamic Golden Age, postulated an early form of the law of gravitation on Earth [2]. Translational and intellectual movements brought Arabic knowledge to Europe, paving the way for Isaac Newton to recognize that the motion of planetary bodies and the motion of objects on Earth are governed by the same principle, specified in his law of gravitation,

Isaac Newton supposedly discovered gravity while watching an apple fall from his apple tree. Courtesy of ESVA/Rob Bishop Photos (cropped).

$$F = G\frac{m_1 m_2}{r^2}$$





Overview and Significance

Overall Focus:

Communicating physics through images and narratives.

Impact:

- Explored new avenues and directions for CHP teaching guides.
- Compiled material on under-told history surrounding introductory physics topics.
- Drew awareness to physics topics through CHP and NBLA platforms.

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Thank you!

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Finally, thank you to all of my mentors who encouraged me thus far.

Questions?

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