

HST2019



THEORETICAL PHYSICS & HIGGS PHYSICS

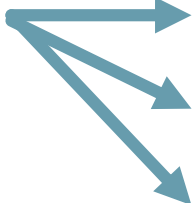


FOCUS GROUP 4




THE BOWLING PROS

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CURRICULUM & CLASSROOM CONNECTIONS

- Nature of Science
 - Process of Science
 - Goals of Science
 - History of Physics
 - Model Building & Testing
 - Gravity (Einstein, Newton)
 - Light (Maxwell, Einstein)
 - Atoms (Democritus, Thomson, Rutherford, Bohr, Electron Cloud)
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KEY IDEAS

- Theory's role in the process of science
 - Importance of thinking
 - Mathematic's role in Theoretical Physics
 - Simple ideas
- 
- What's a theory?
-
- There are no wrong models:
Nature is the "judge"
- 
- Higgs prediction /discovery
-
- Collaboration
- 
- What do theoretical and experimental physicists do?

POTENTIAL CHALLENGES

STUDENTS	TEACHERS
Difficult words/concepts (quantum, field, function, model, theory, principle, law)	Practical activities/images could induce misconceptions
Be able to think outside the box	Reliable resources in Higgs Physics
Complex Math leads to difficulties in understanding Theories	
Abstract thinking	

HELPFUL MATERIAL & RESOURCES

a) **Cartoon pictures for physics and HIGGS to make it fun and some extra visuals**

<https://docs.google.com/document/d/1iR8Hi8o-bSeEvpSmMEJrlmcJmfAOXaRgYwcZdnxC0lY/edit?usp=sharing>

b) **Tools to make Higgs discovery more visual:**

<https://www.youtube.com/watch?v=wZpfHzlhuZg> - ATLAS Higgs ZZ animation

<https://www.youtube.com/watch?v=imOpF9bP0wc> ATLAS Higgs 2-photon animation

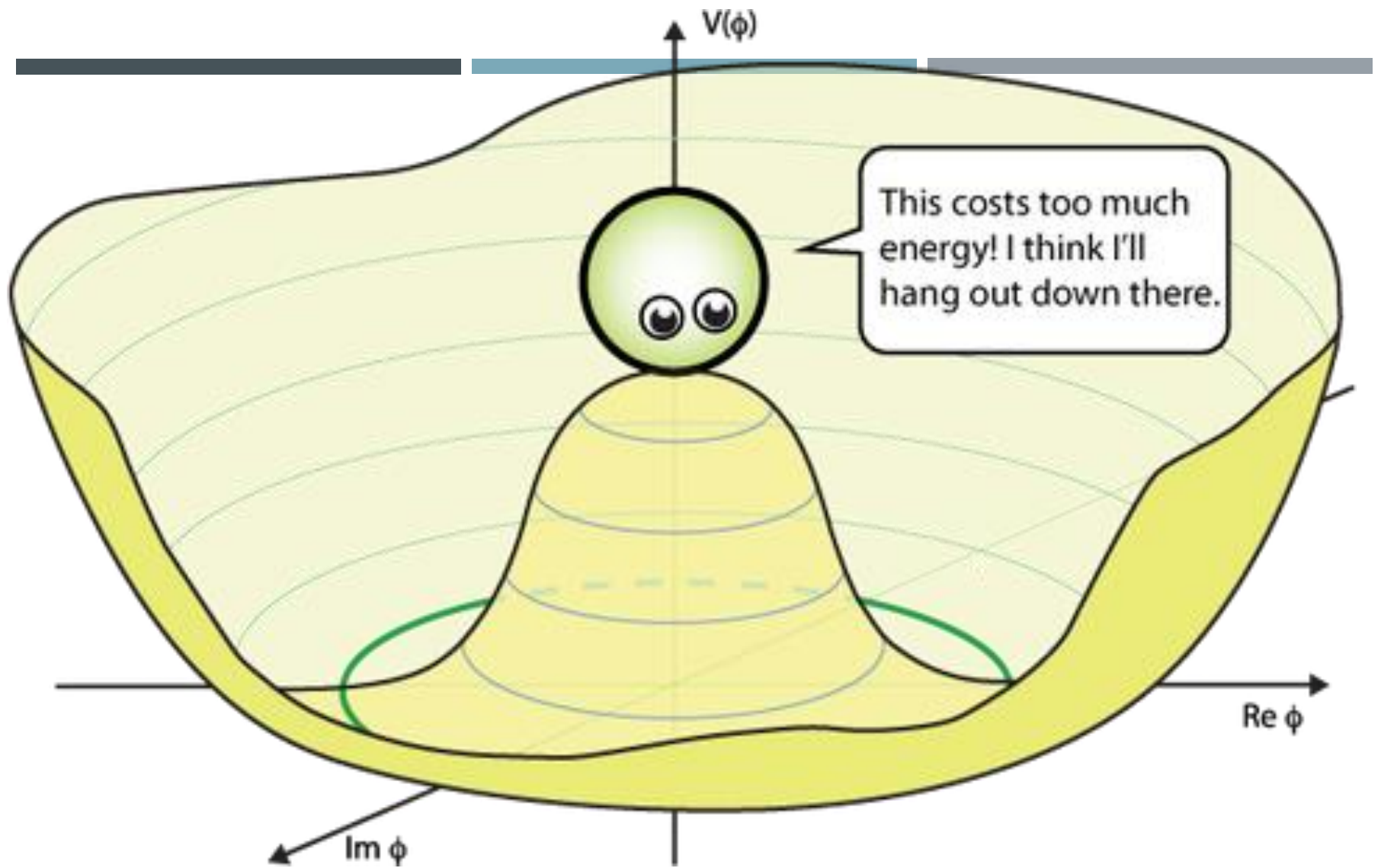
<https://www.youtube.com/watch?v=IEIHgJG5Fe4> - The basics of the Higgs boson - Dave Barney and Steve Goldfarb

<https://www.youtube.com/watch?v=L6AN6UwTTjU> - The Higgs Boson Simplified Through Animation

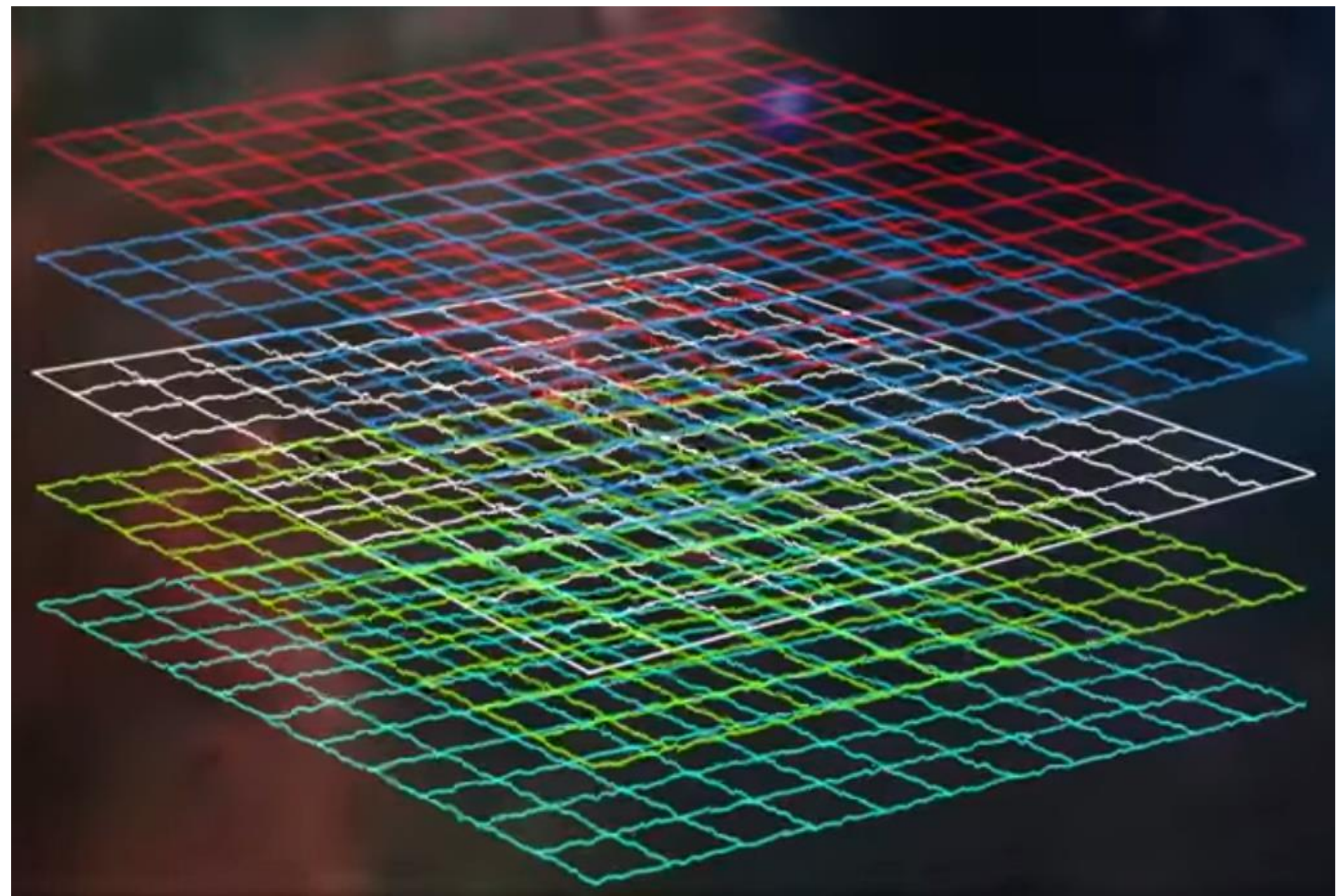
<https://www.youtube.com/watch?v=qyPQIJlHeU0> - The animation of signal accumulation in the Higgs boson decaying to two-photon channel

c) **Model Building**

<https://resources.perimeterinstitute.ca/>:- Process of Science Resource:Activity 4, Making Models

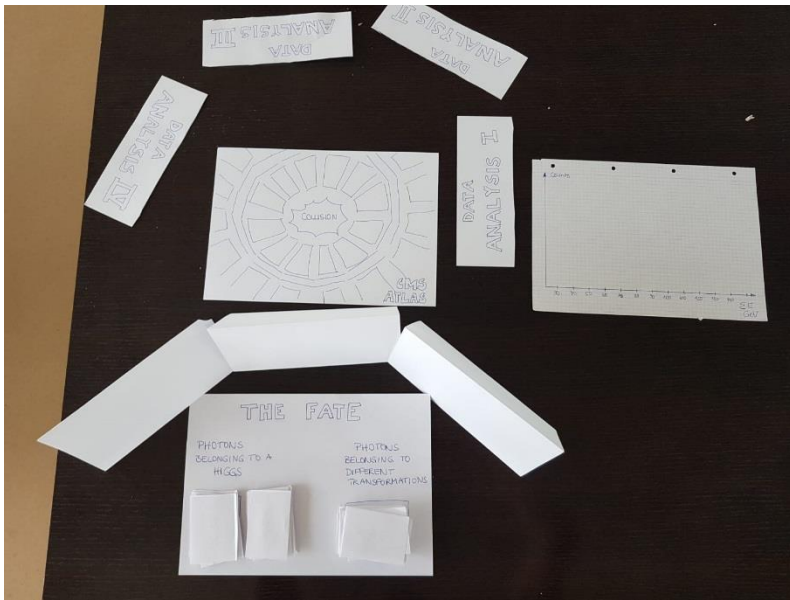


Source: www.quantumdiaries.org



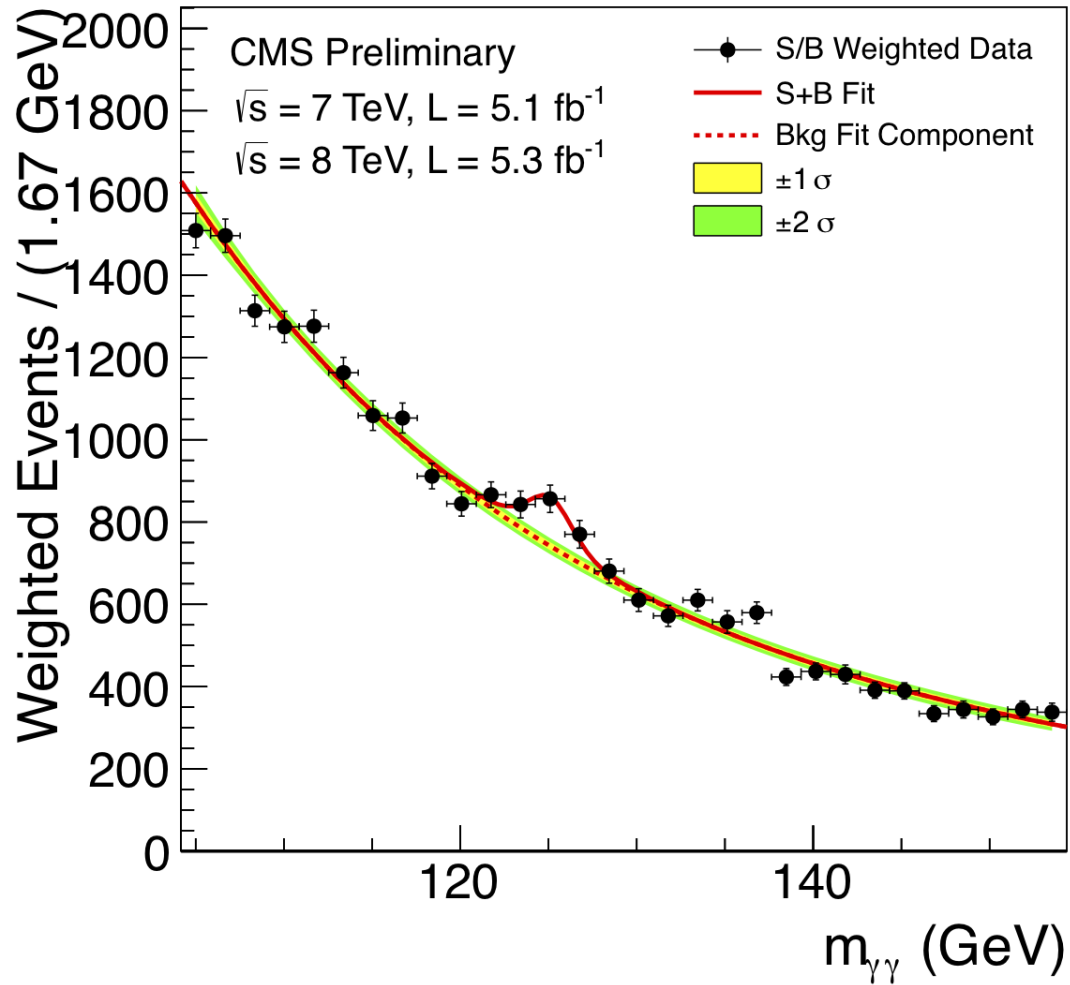
Source: PBS Space Time

BEST PRACTICE EXAMPLE – POTENTIAL CLASSROOM ACTIVITY



Field testing with a
Physicist ...



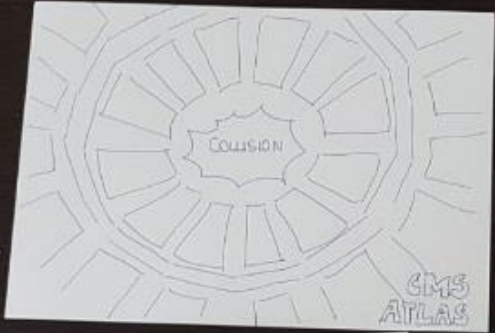


<http://cms.web.cern.ch/news/observation-new-particle-mass-125-gev>

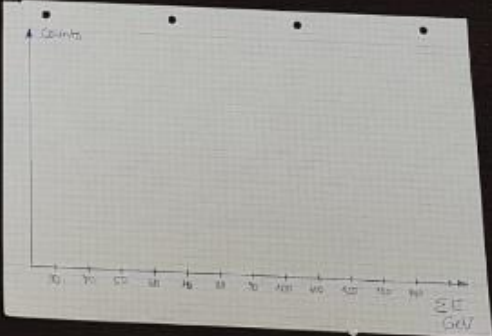
DATA ANALYSIS III

DATA ANALYSIS II

DATA ANALYSIS IV



DATA ANALYSIS I



THE FATE

PHOTONS BELONGING TO A HIGGS

PHOTONS BELONGING TO DIFFERENT TRANSFORMATIONS

