



Accelerate!

**Hands-on particle &
accelerator physics
(in the classroom!?)**

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www.physics.ox.ac.uk/accelerate

What is 'Accelerate'?

- Set up in 2008 between Oxford Physics (S.Sheehy, B. Foster) and CERN (E. Tsesmelis)
- Received funding July 2008, STFC (UK), £7898
- 45-minute interactive science show

Proudly supported by



**Science & Technology
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Aims (Audience)

- 1) To provide a novel method of **engaging** students, teachers & the public with **current particle and accelerator physics research**, and to enhance understanding of basic physics concepts through exciting, relevant examples and applications.



Aims (Audience)

2) To change preconceived ideas about science, particularly physics, and **ignite curiosity** about science and technology. Overall, audience members should leave with the impression that science is **fun, relevant and exciting**. In addition, by providing current university students as **role models**, it is hoped the audience will also leave with a positive view of further study in science, or a career in science.



Aims (Physicists)

3) To provide **young physicists** at the undergraduate and graduate level with a unique opportunity to develop **science communication skills**.



Aims (Physicists)

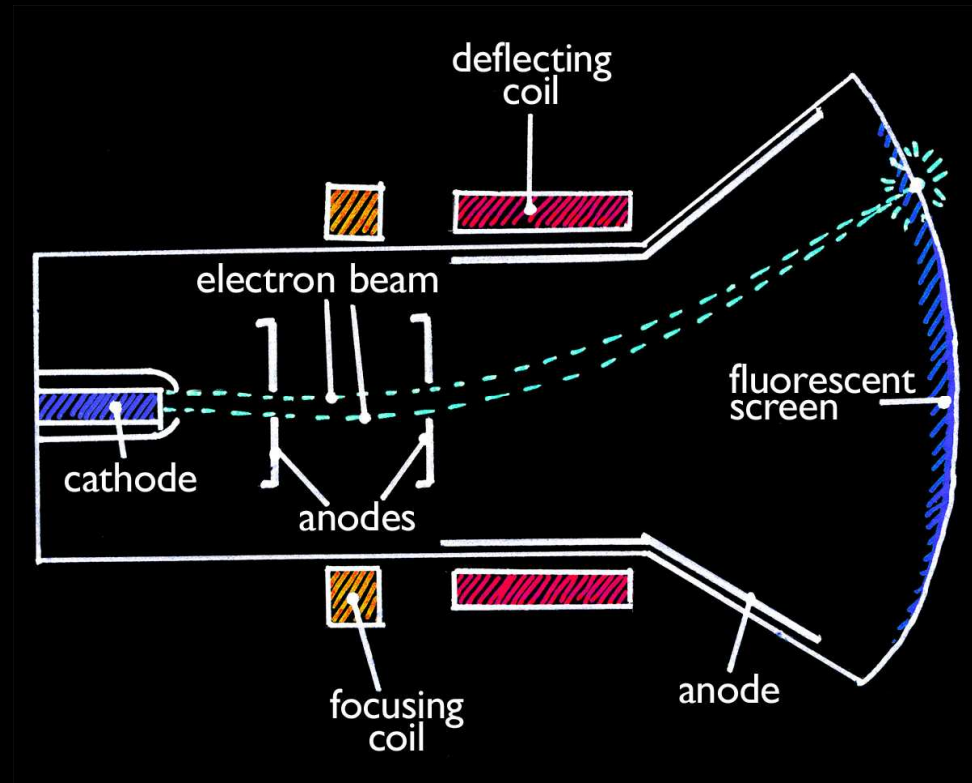
- 4) To provide an example, and thus promote, **collaboration** in science outreach and public engagement between major research labs, universities, schools and the public.



Royal Society Summer Science Exhibition “Accelerators Everywhere”

The Accelerate! Show

- Particles
- Energy
- Control
- Collision
- Detection

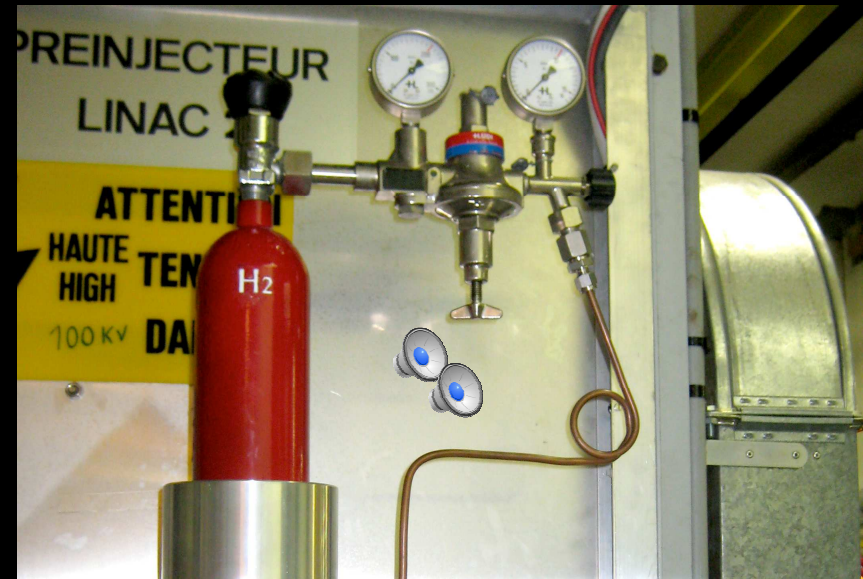


Particles

- Electrons, protons and more



Protons can be obtained from hydrogen, but it is also used to fuel rockets!



A drop of water contains 4,000,000,000,000,000,000 hydrogen atoms!

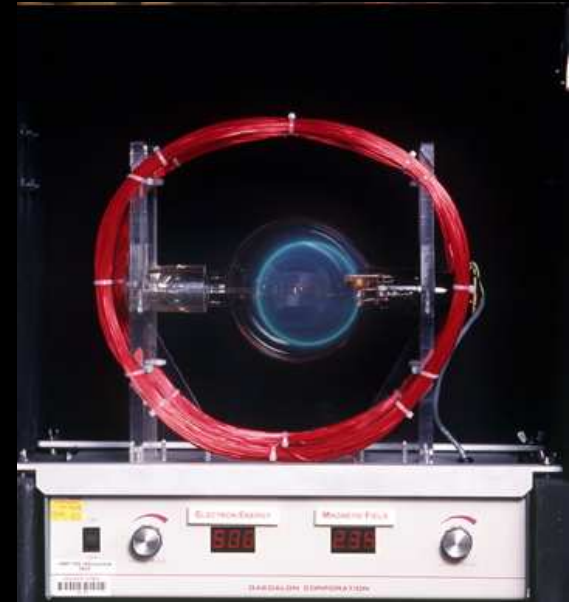
Energy

- Static electricity & Van de Graaff
- Need for high energy
- Using a 'wave' to accelerate
- CLIC RF cavity

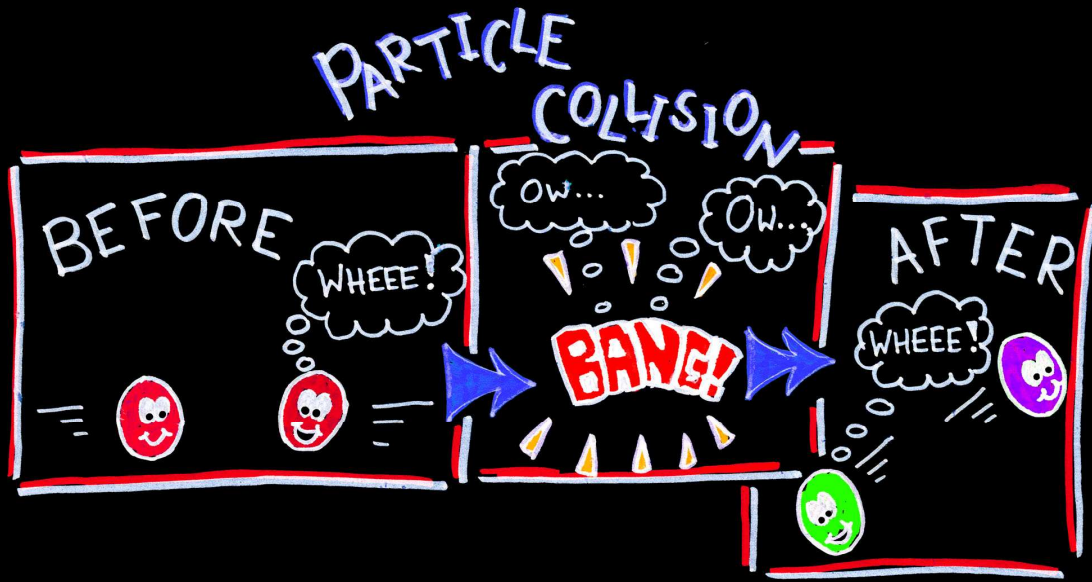


Control

- Electromagnets
- High energy = strong magnets!
- More current ?
- Superconductor + LN2



Collision



- $E=mc^2$
- Create new particles

- Target vs collider

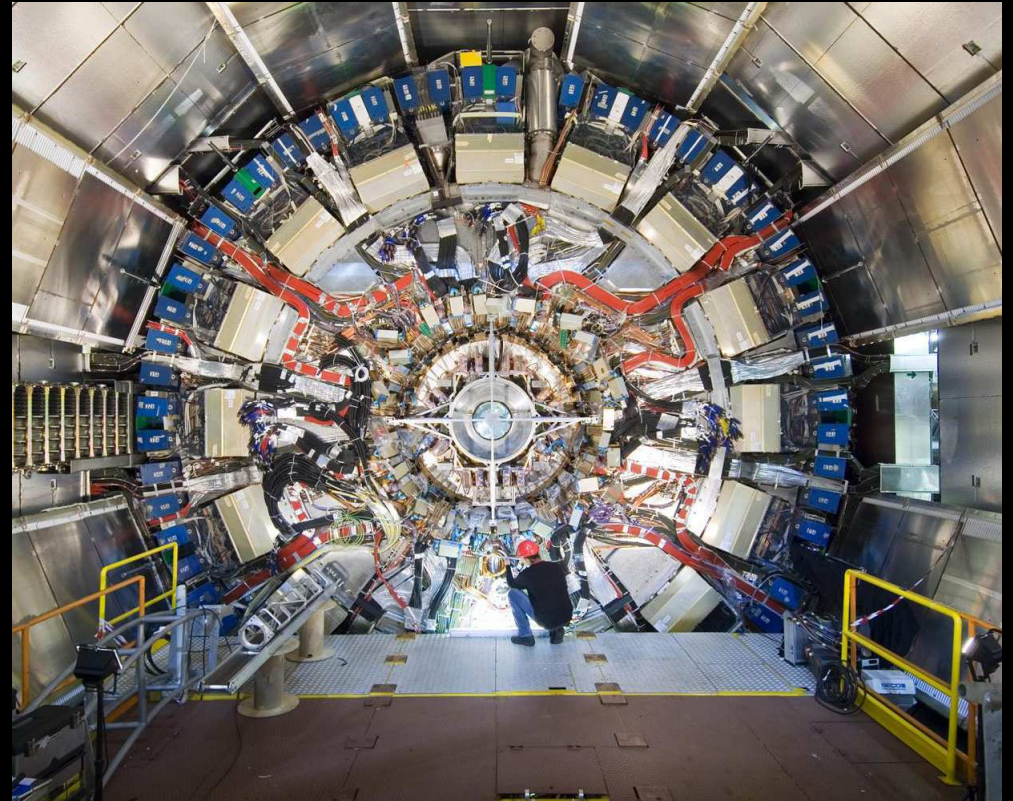


Detection



- Cloud chamber
- See real particles!

- Digital camera
- @ 40MHz!



Activity

- Make your own classroom demonstration or activity using materials you have or could easily get

Example: Reconstructing collisions

Materials: table, piece of board with drawing paper/pens, marbles & strange shaped object

Aim: to see whether it is possible to reconstruct the shape of an object accurately by colliding something with it.

Method:

- Put object in centre of a table with stiff board + paper on top (the object must be secure enough not to move)
- Repeatedly bounce marbles off the object, tracing the path of the marbles on the paper.
- Try to reconstruct the shape of the object from the “tracks” of the marbles

Connections to PP/AP:

- Scattering from objects, how particle detectors work, reconstructing tracks, vertices etc...



Accelerate!

www.physics.ox.ac.uk/accelerate

Email us at accelerate@physics.ox.ac.uk

Thanks to

STFC, CERN, Oxford Physics, JAI

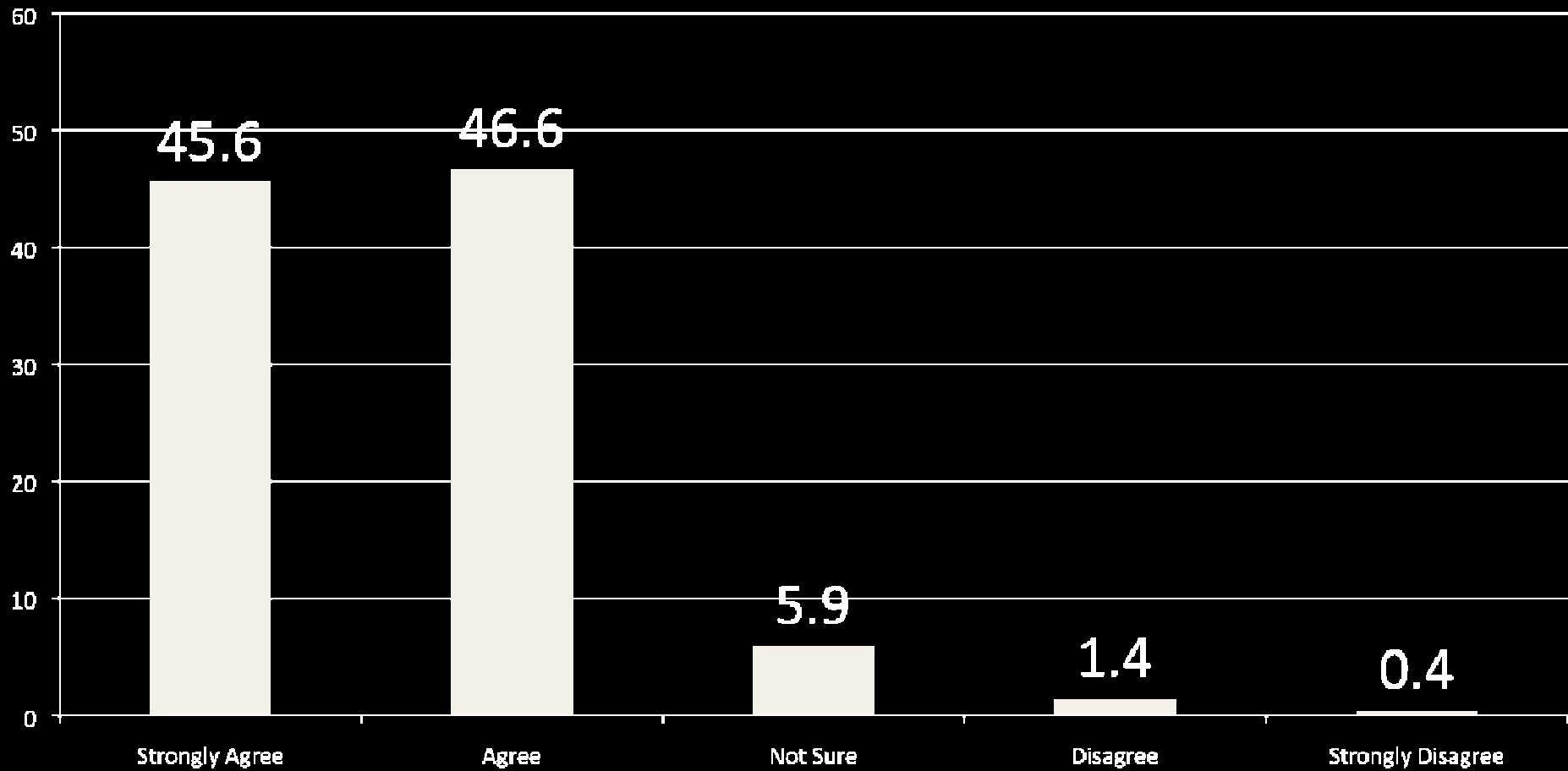
The Spun Rivals, for their song *Standard Model*

Where are we now?

- Show is winding up 😞
- Lots of volunteers (10 presenters + 10 others)
- Lots of demand
- Great feedback
- Great experience for students
- Will be written up as resource for schools/teachers and research labs (SLAC & TRIUMF both want to re-create the show)

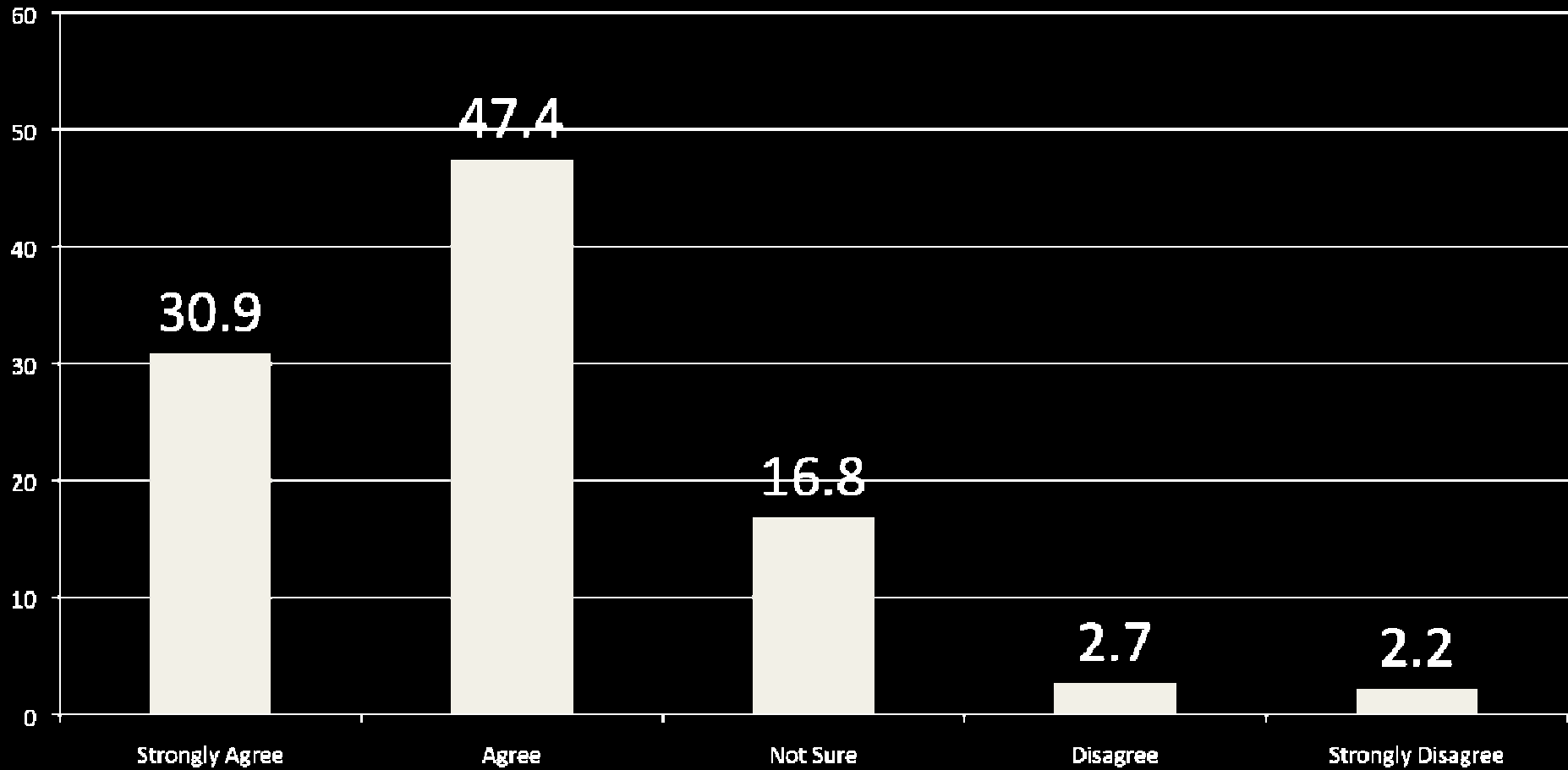
Quantitative Evaluation

Did you have fun during the show?



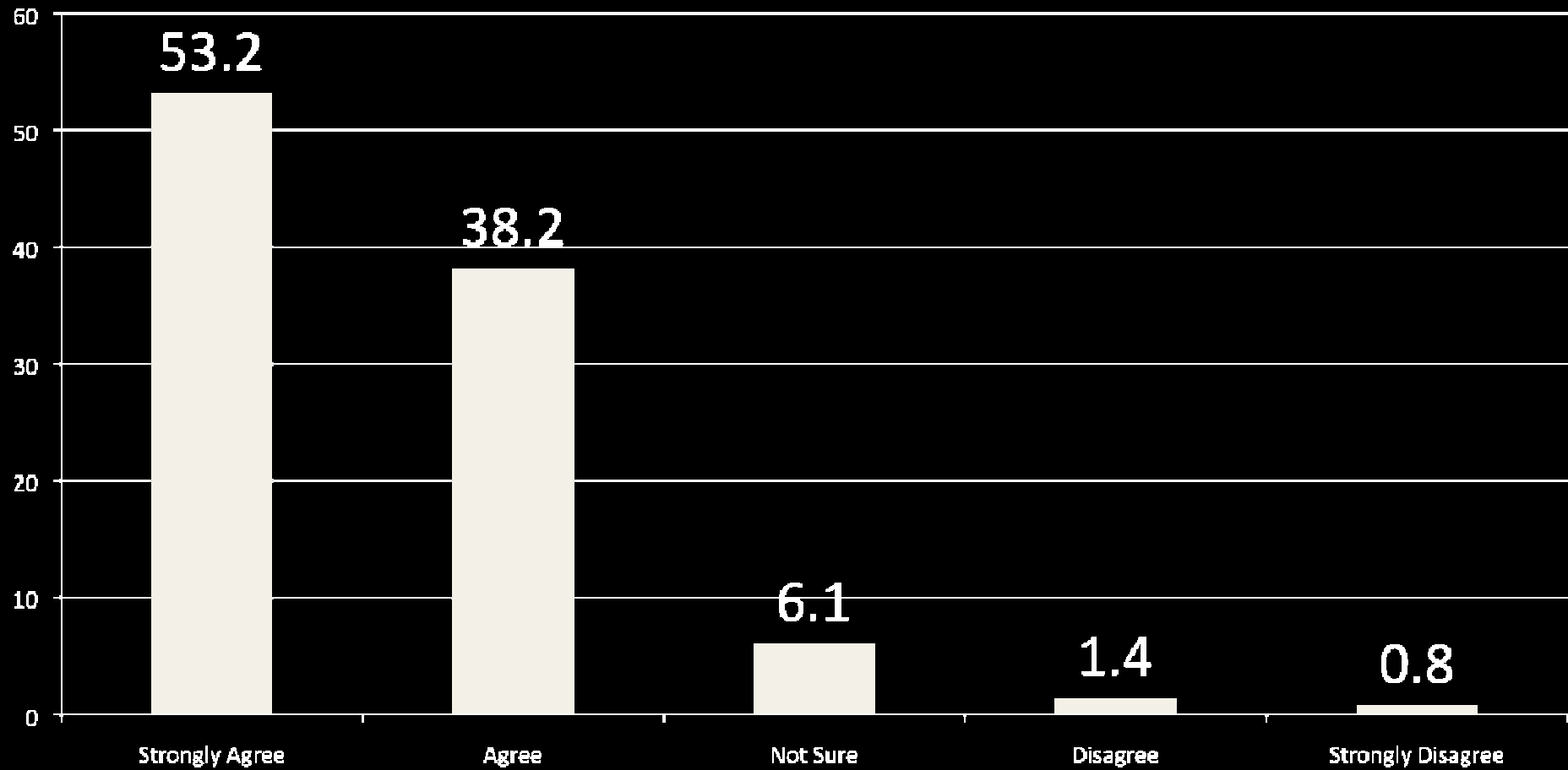
Quantitative Evaluation

Do you feel you understood the science?



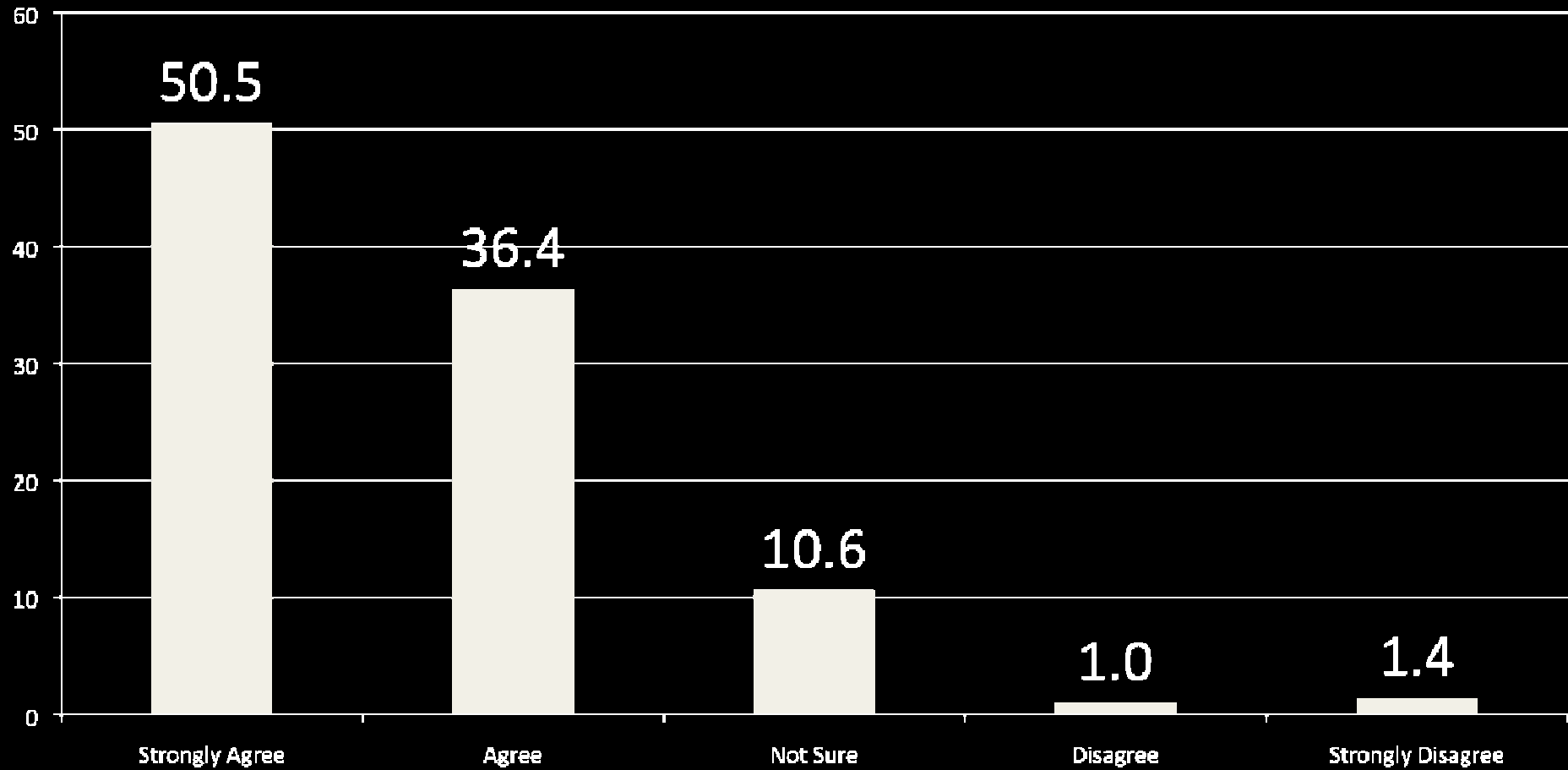
Quantitative Evaluation

Do you think the presenters did a good job?



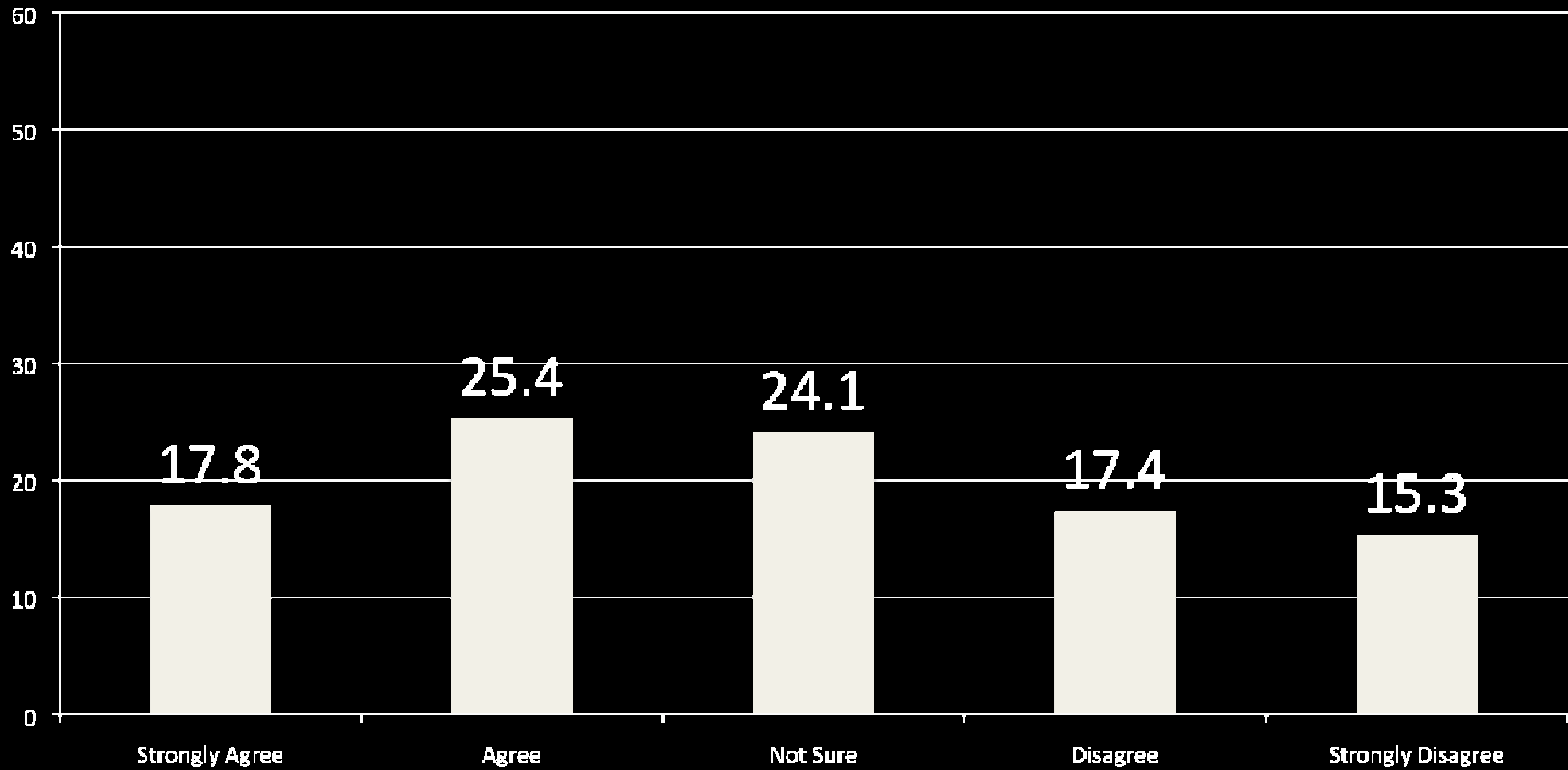
Quantitative Evaluation

Do you think this is a good way of learning about physics?



Quantitative Evaluation

How interested were you in physics before you saw the show?



Quantitative Evaluation

Are you more interested in physics now you have seen the show?

