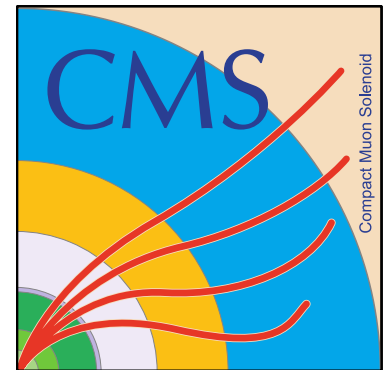


# Involving young physicists in instrumentation: A personal case study

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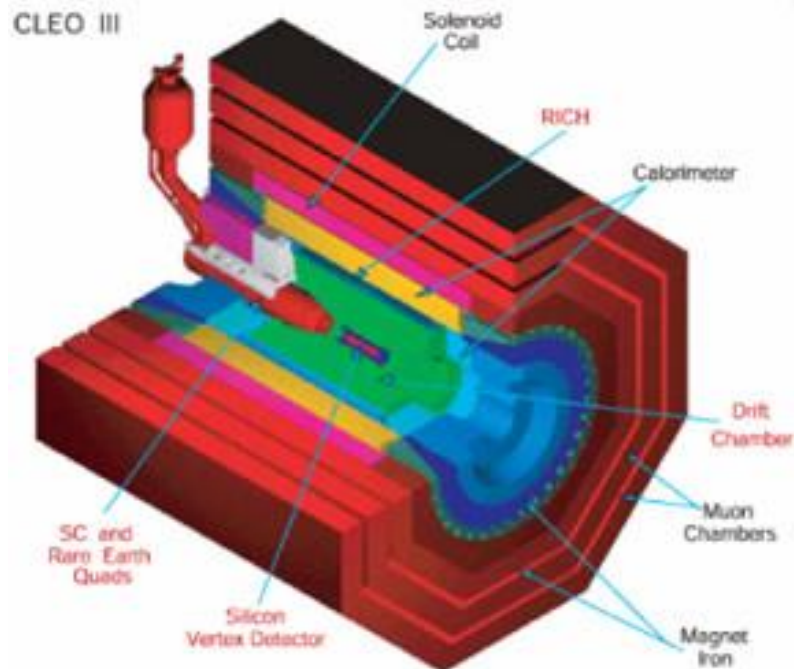
- ✿ This view is polled and biased from my experience and my peers.
  - I have not worked in the cosmic frontier (I'm not opposed to it, but nobody has offered me a job there yet.)
  - My work in the intensity frontier was not in neutrinos (but I have who do.)
  - I do work with the Snowmass-Young group which crosses frontiers and I can say that my experience isn't extraordinary.
- ✿ Is there any way to abandon the "frontier" model? It pigeon-holes people early in their careers.



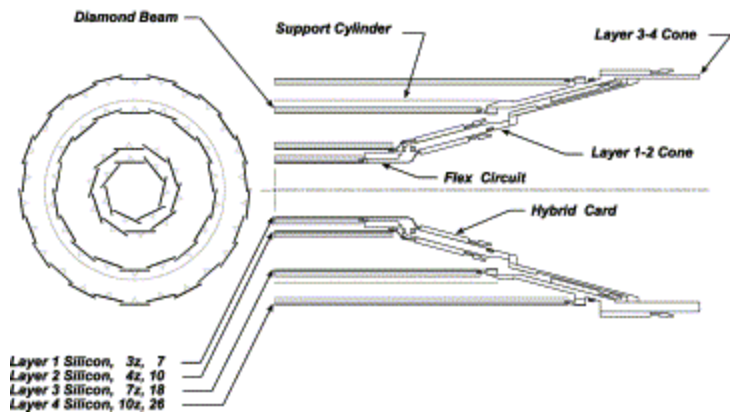
✿ I was a summer REU student at Cornell where I had the opportunity to work with David Kreinick trying to develop a tracking algorithm for the CLEO III Level3 trigger.

- I don't think it ultimately worked.

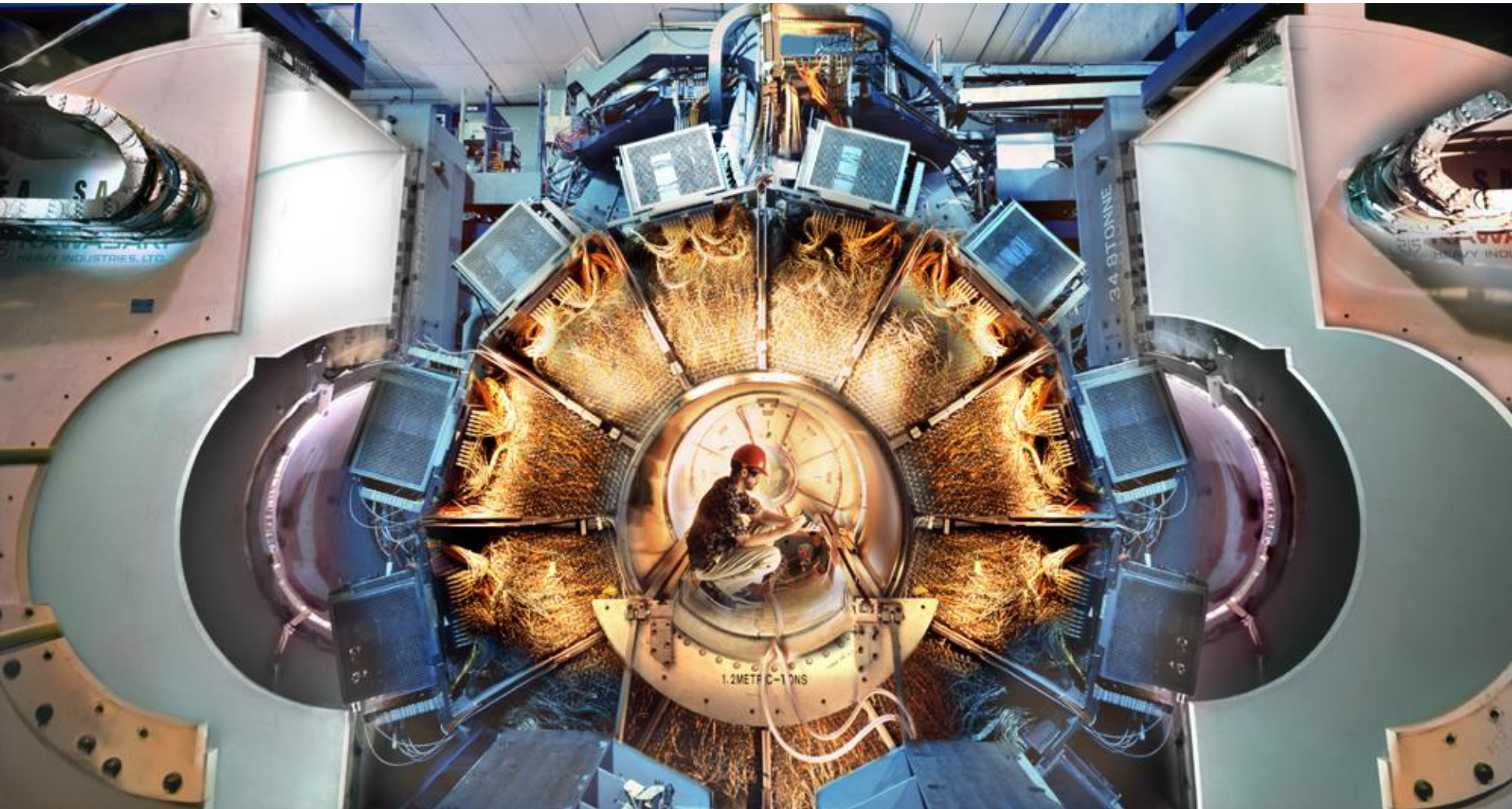
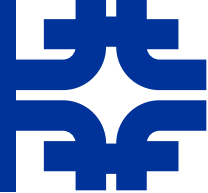
✿ I had to learn about the CLEO silicon tracker and I was hooked.



The CLEO III Silicon Detector



# My next experiment



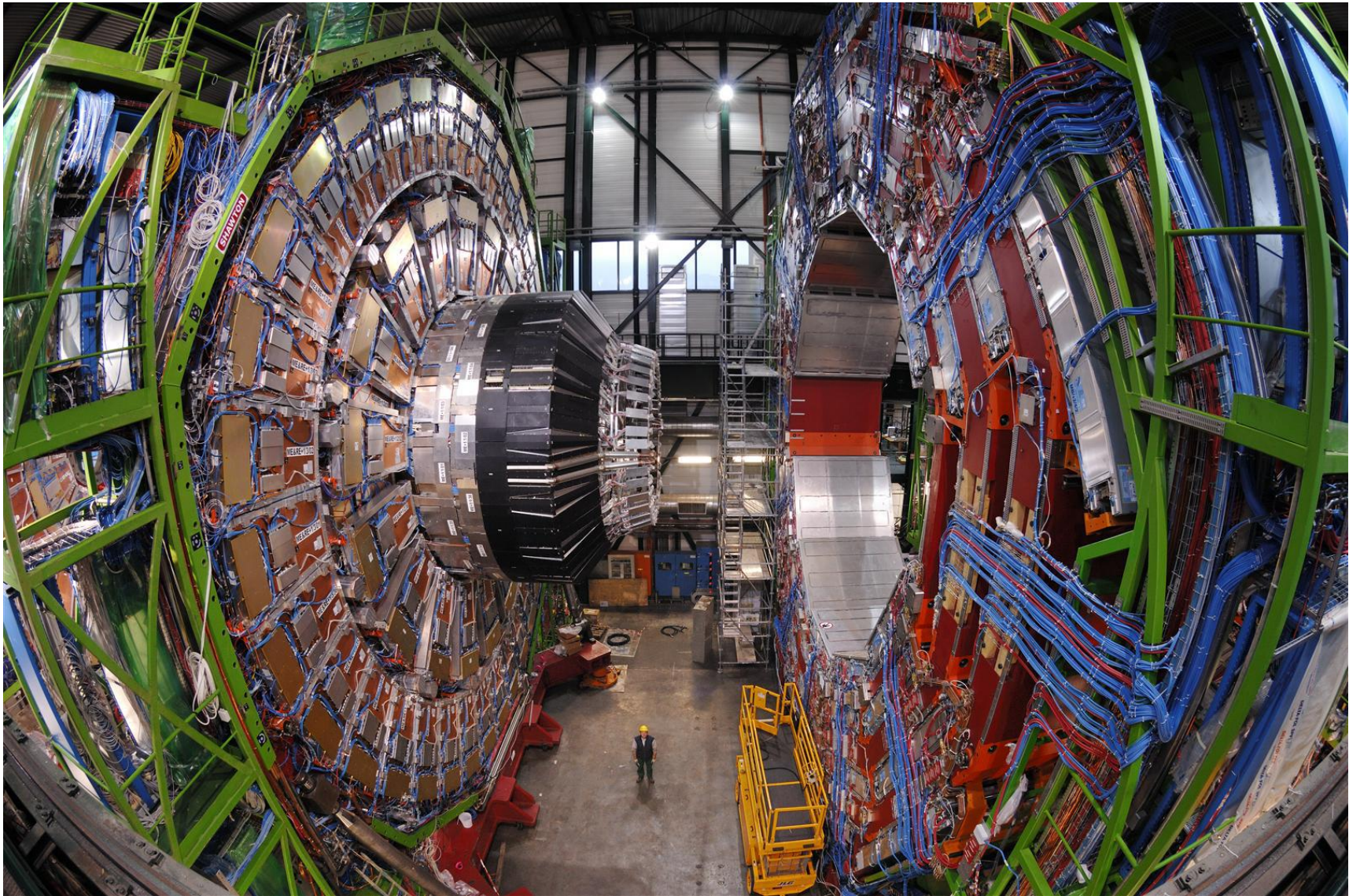
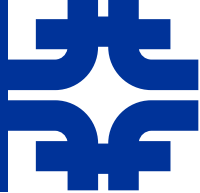


- ✦ In graduate school, I worked on the BaBar silicon tracker.
  - I was mostly maintenance and operations.
    - changing power supplies
    - topping-off chillers and bubblers.
    - etc.
- ✦ I also had the opportunity to actually undress and re-dress the SVT, twice.
- ✦ Still hooked on having my hands on a detector.





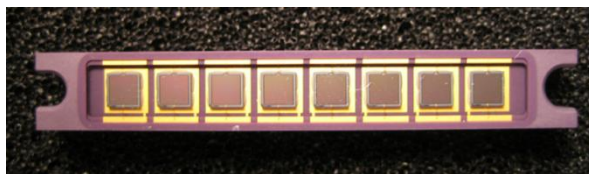
# Another move





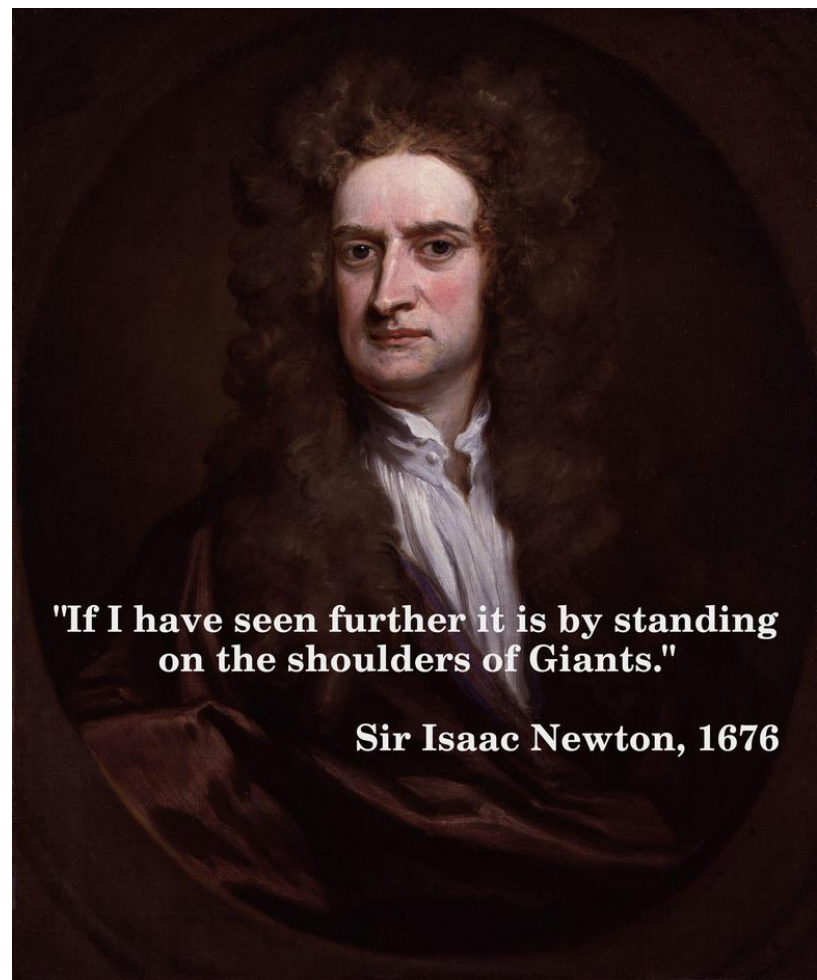


- ✦ As I joined CMS, I specifically sought out a project that would let me work on new hardware.
- ✦ I joined the Hcal upgrade project and immediately began contributing to the understanding of SiPM sensors and how they would and could be used within CMS.



- ✦ Along the way I have:
  - Laid out a circuit board for ASIC irradiation testing.
  - Worked on the beam line of two test beam efforts and participated in two others.
  - Helped assemble SiPM boards for our upgrade.
  - Written large portions of the CMS upgrade simulation code.
  - Helped write a chapter in the CMS Hcal upgrade TDR.

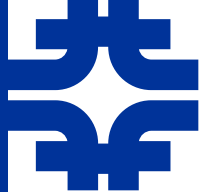
- ✿ I haven't ever started and finished a project.
  - BaBar had been running for years when I joined in 2004.
  - The CMS Hcal was started while I was still in high school.
  - CMS Hcal had been using SiPM's in test beam for a couple of years before I joined in 2009.
- ✿ I'd like to help design a new detector.







# How can the youth be engaged?



- ✿ Start them young. Hardware is fun to work on. The signal purity will be low at this stage, but we don't have any other options.
- ✿ Test beams are crucial.
- ✿ Don't be afraid to slow down a little.
  - I've had high school students working on CMS Hcal studies.
  - They don't go as fast, but the work is still valuable.
- ✿ Occasionally take the short view.



# Provocative statements to discuss



- ✿ “All of the jobs go to ‘analysis-jocks’. Why would I work on hardware?”
- ✿ Do the labs and universities have a plan to train, maintain and grow instrumentation expertise?
- ✿ What are hot areas of instrumentation? is it 3D sensors, is it SiPMs and their relatives, is it fast timing, is it FPGA’s, ... does it really matter?
- ✿ What would be a career arc for a young instrumentalist to keep in mind?
- ✿ Can a young person really move from one “frontier to another”? Why do we need the frontiers any more?