

The NOvA Experiment

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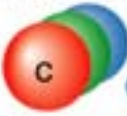







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Why is the Universe the way it is?

- Why are there three dimensions?
- Why is there inertial and gravitational mass?
- Why are there four fundamental interactions?
- Why are there three families of two quarks each?
- Why are there three families of two leptons each?
- Why is there little antimatter?
- Why is there dark matter?
- Why is the expansion rate of the Universe increasing?

What are neutrinos?

	Quarks		Leptons	
Generation 3	 t Top	 b Bottom	 τ Tau	 ν_τ Tau-neutrino
Generation 2	 c Charm	 s Strange	 μ Muon	 ν_μ Muon-neutrino
Generation 1	 u Up	 d Down	 e Electron	 ν_e Electron-neutrino

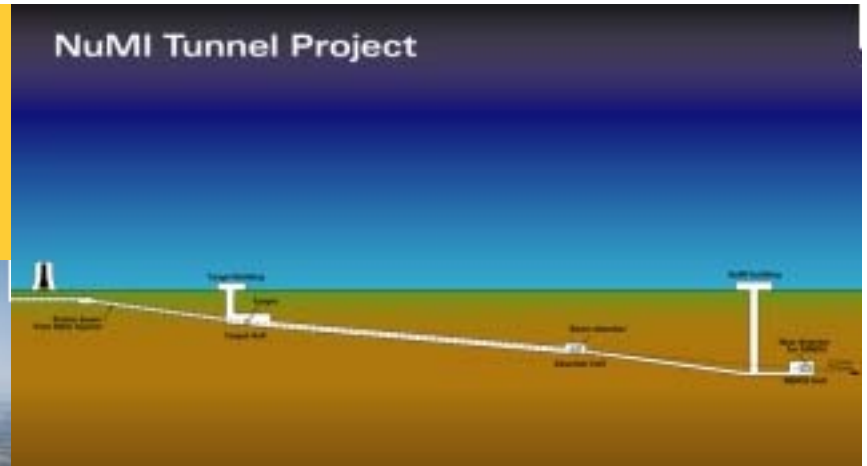
What do we know about neutrinos?

- There are three types: e , μ , τ
- They have mass
- They can “oscillate” from one type to another
- They experience only “weak” interactions with ordinary matter
- There are lots of them

What don't we know about neutrinos?

- Their actual mass
- The relationship between neutrinos and antineutrinos and its possible connection to the antimatter question
- The pattern of neutrino oscillations

The NuMI Beam



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The NOvA Far Detector Lab

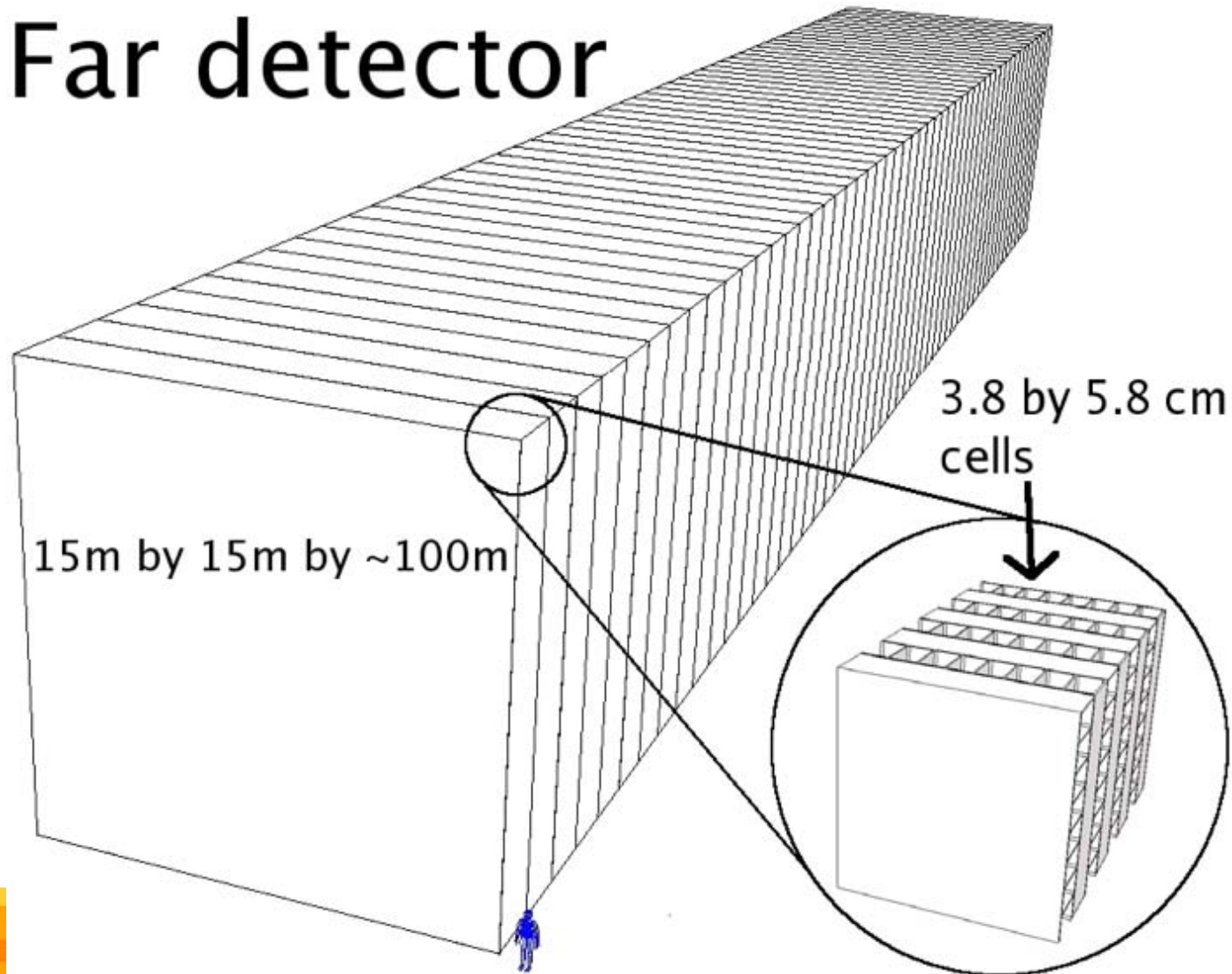


The NOvA Far Detector Lab



NOvA Far Detector

Far detector



NOvA Far Detector



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How the NOvA Detector Works

- Neutrinos interact and produce charged particles
- Charged particles produce light in liquid scintillator
- Light is wavelength-shifted and transmitted to Avalanche Photodiodes
- APDs convert light into electrical signals
- Pattern of light deposition is interpreted as particle tracks
- Tracks are connected together and interpreted to specify properties of interacting neutrino

What you will see

- >100,000 ft “factory” staffed a few engineers/technicians and many undergraduate students
- Receive PVC extrusions from factory in Manitowoc WI
- Insert loop of wavelength-shifting fiber, glue endcap, glue manifold, test for leaks
- Lots of QC, all operations tracked in database

Arrangements for visit

- Bus to factory
- Split into 2 groups.
- Group 1 will tour the factory and see how each process is done. That group will split up into ~6 smaller groups for the tour which should last about 20 minutes.
- Factory Supervisor Nathaniel Pearson will talk to Group 2 about the challenges of building the detector modules and a factory to produce them.
- Switch
- Return by bus