

# CHARACTERIZING CAMERAS

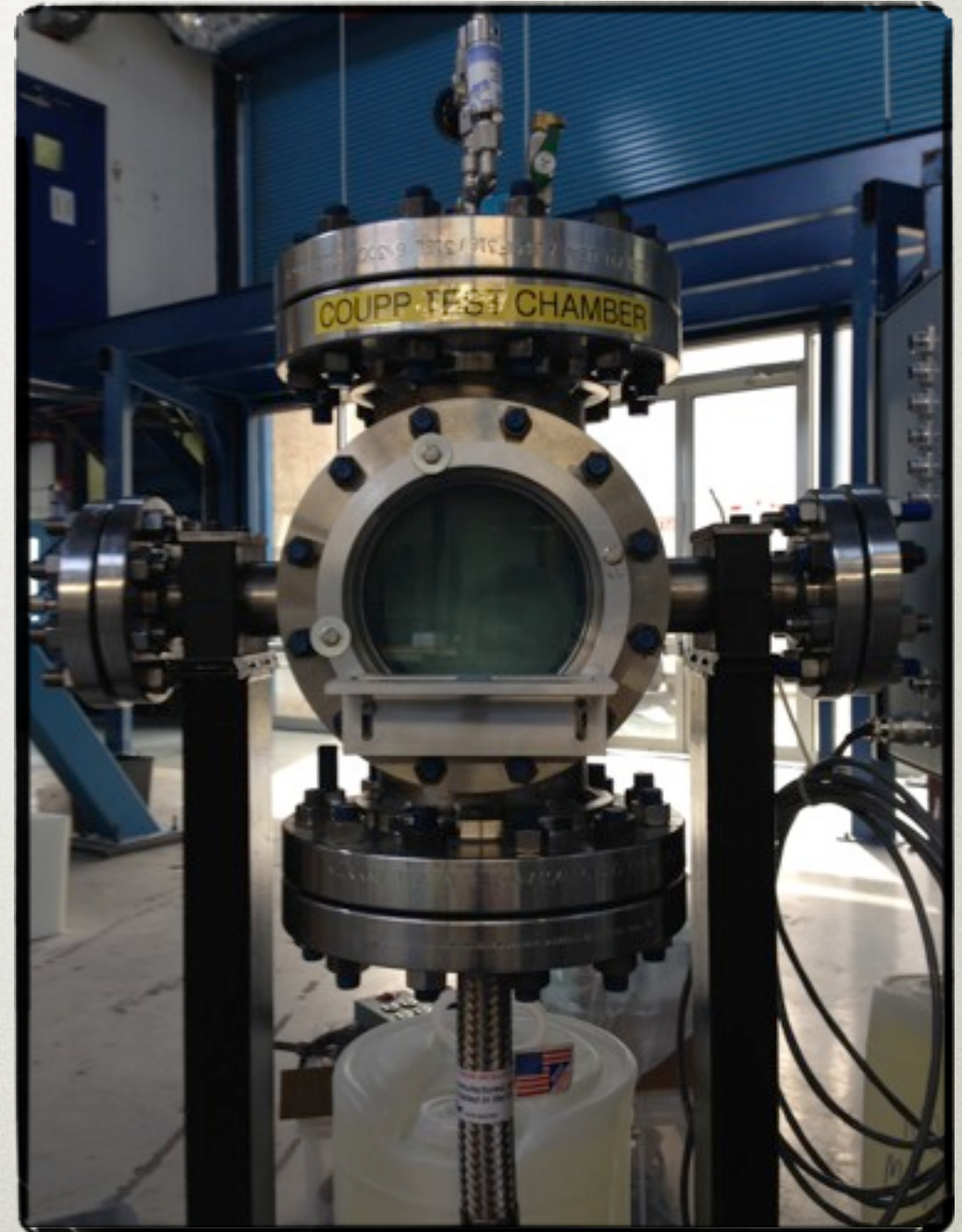
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# WHAT'S THE POINT?

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- Exclude bubble events along chamber walls
- 3D Reconstruct events
- Prepare a functioning camera system

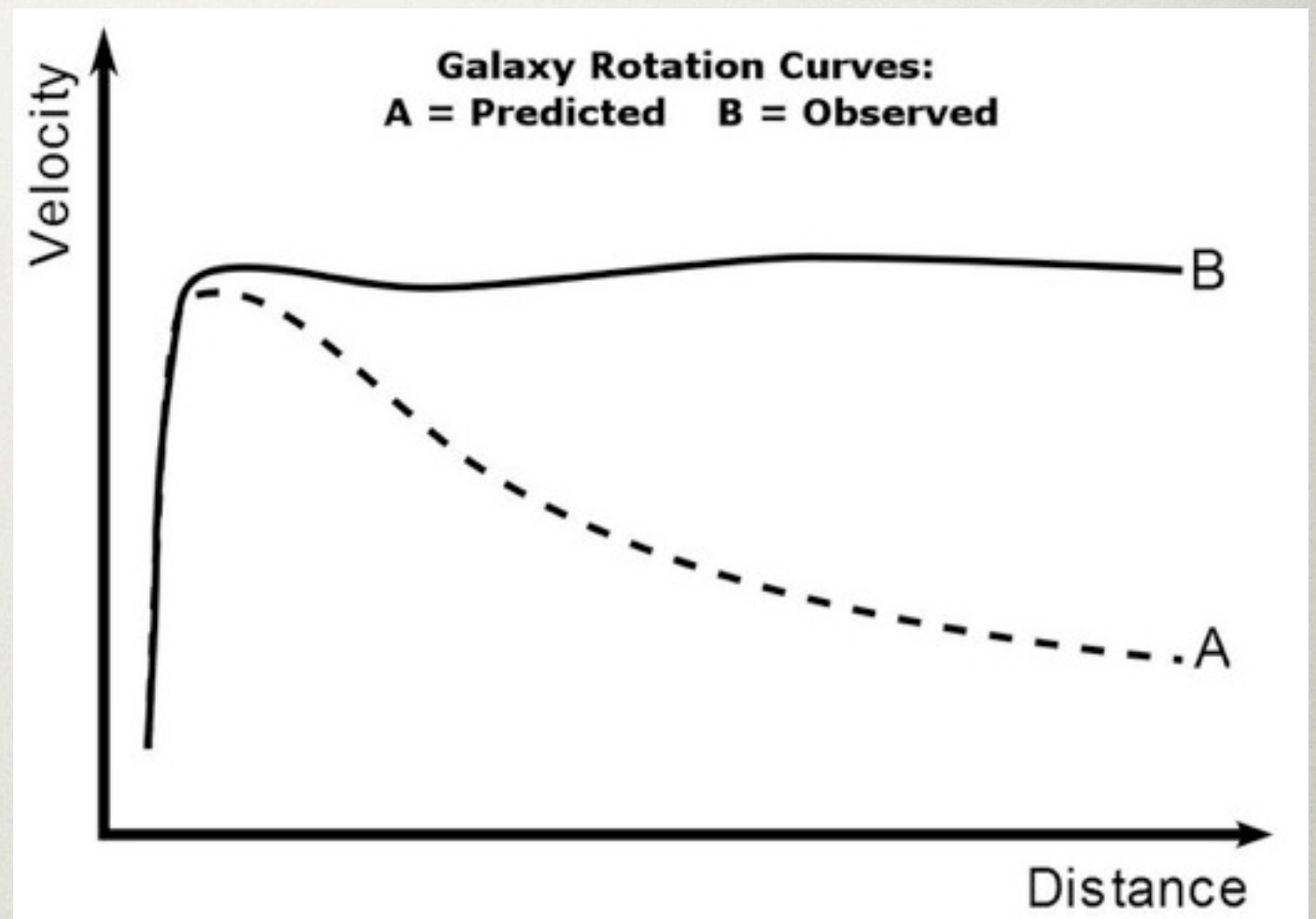




# WHAT IS DARK MATTER

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- Galaxies appear to spin too fast for their mass
- Theorists came up with a new particle, the WIMP





# WHAT IS DARK MATTER

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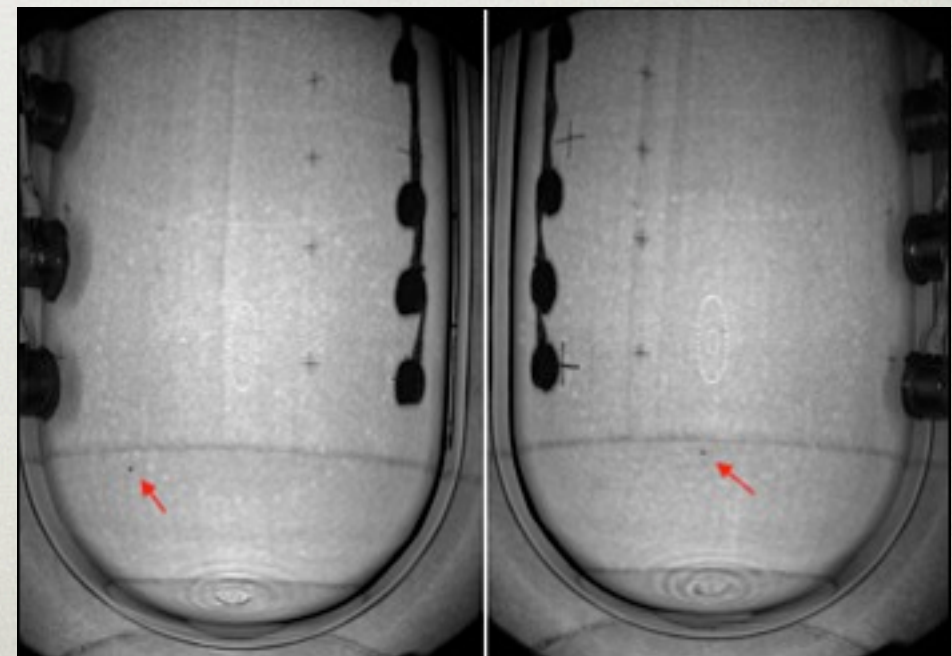
- Shares many characteristics with Neutrons
  - Neutrons also only interact weakly
  - Huge source of error in every direct observation of dark matter experiment
- A few candidate particles
  - The lightest supersymmetric partner particle (Neutralinos?)
  - Something entirely new altogether



# COUPP AS A WHOLE

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- Bubble chamber that detects dark matter
- Interactions are rare





# INCREASING SIGNAL TO NOISE RATIO

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- Reduce the number of particles that can interact with chamber
- Identify noise events
- Exclude data from noisy areas of chamber

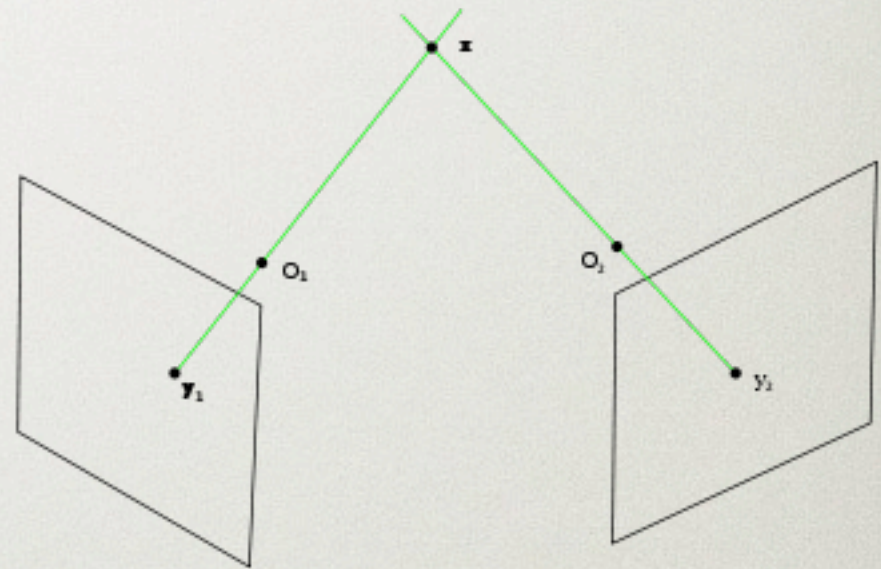




# WHAT'S THE PROBLEM?

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- Stereo 3D assumes a “perfect” setup
  - Parallel cameras
  - Fixed distance “X” apart
  - No lens aberrations
- Numerous refractions remove all sense of distance in the chamber





# WHAT'S THE PROBLEM?

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- Need to orient camera perpendicular to chamber
- Need to know all aberrations in lens
- Need to know each refraction in the light path



# CAMERA ALIGNMENT

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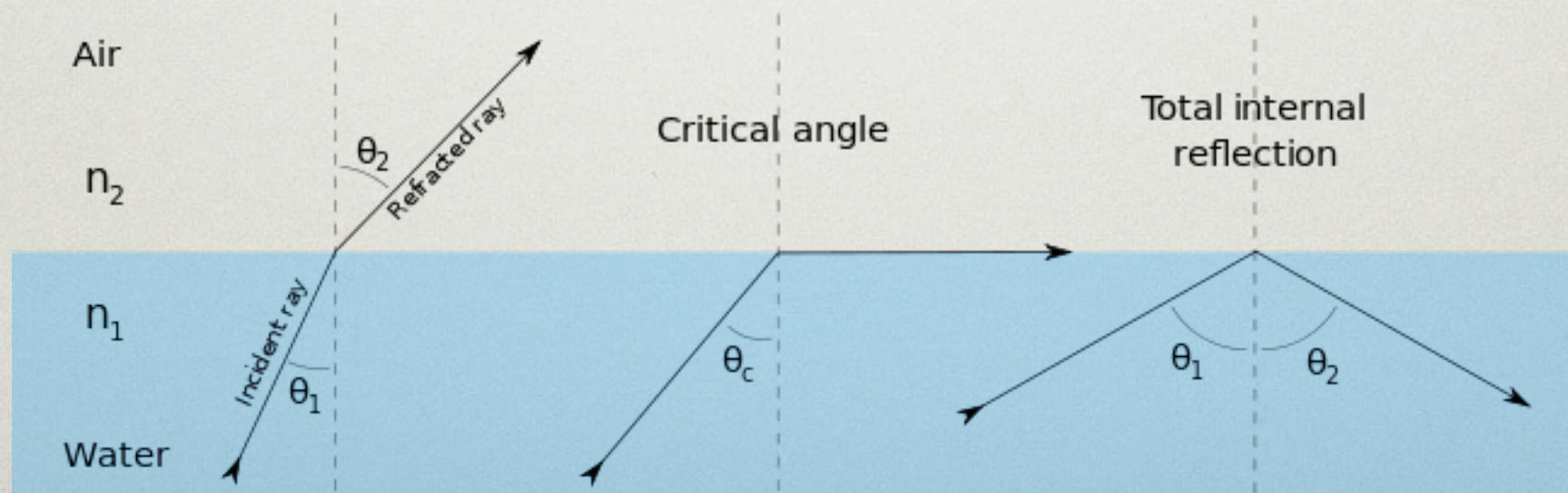
- Mount camera and calibrate
- Learn lens distortions
- Attach mount to chamber
- Realign the chamber





# A MOMENT ON REFRACTIVE INDEX

- Refractive index is directly related to temperature
- Need to know temperature to adjust software





# THE THERMOMETER ISSUE

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- Two types of digital thermometers, each with their own perks and drawbacks
  - RTD (Thermocouple)
  - Thermistor
- Digital thermometers aren't very simple
- Generally a correction factor is required.



# HOW IS THIS RELEVANT?

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- Importance of error identification and reduction
- Importance of precision
- Awesome, modern science.

