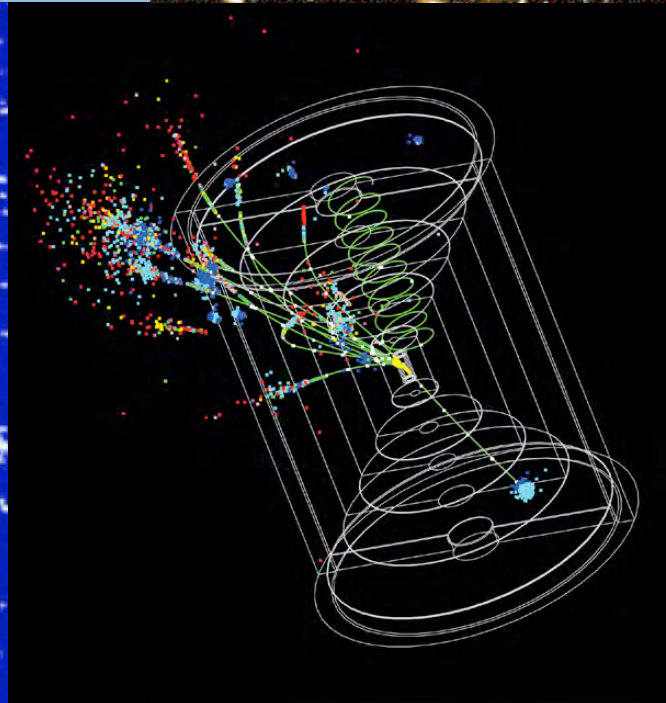
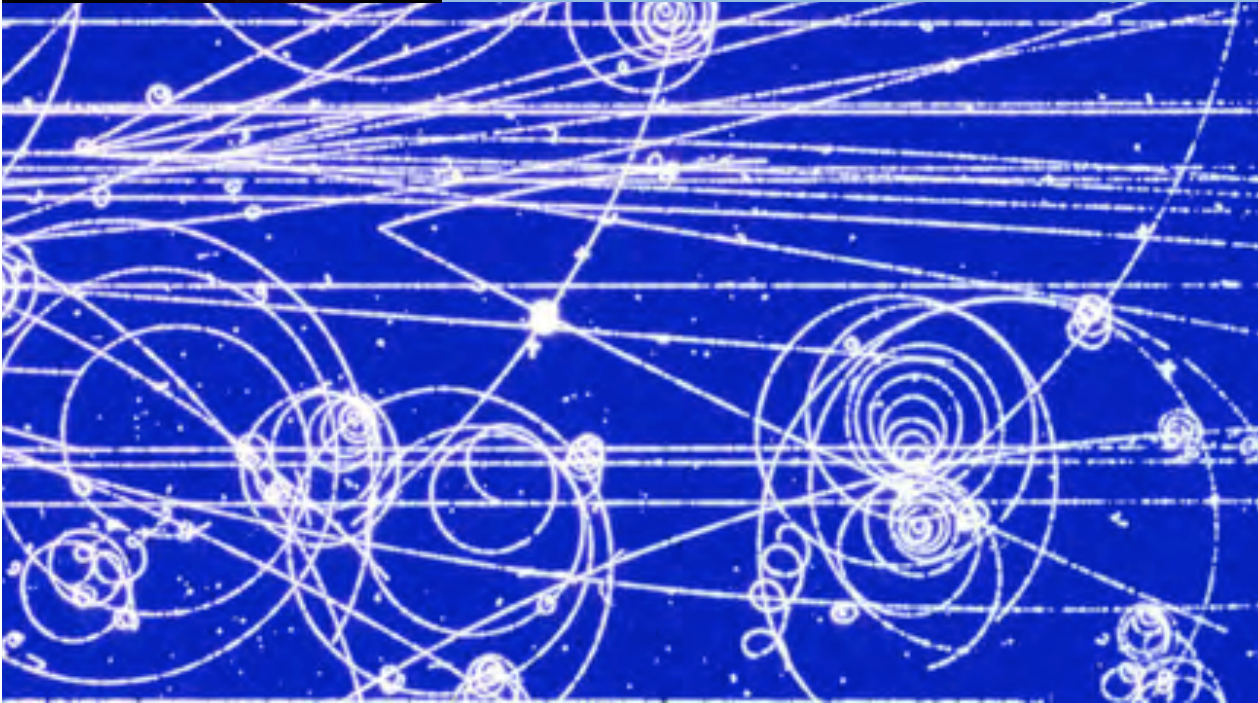




Particles, Energy, and Cosmology



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The End of Physics

"The more important fundamental laws and facts of physical science have all been discovered,

and these are now so firmly established that the possibility of their ever being supplanted in consequence of new discoveries is exceedingly remote."

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The End of Physics - 1894



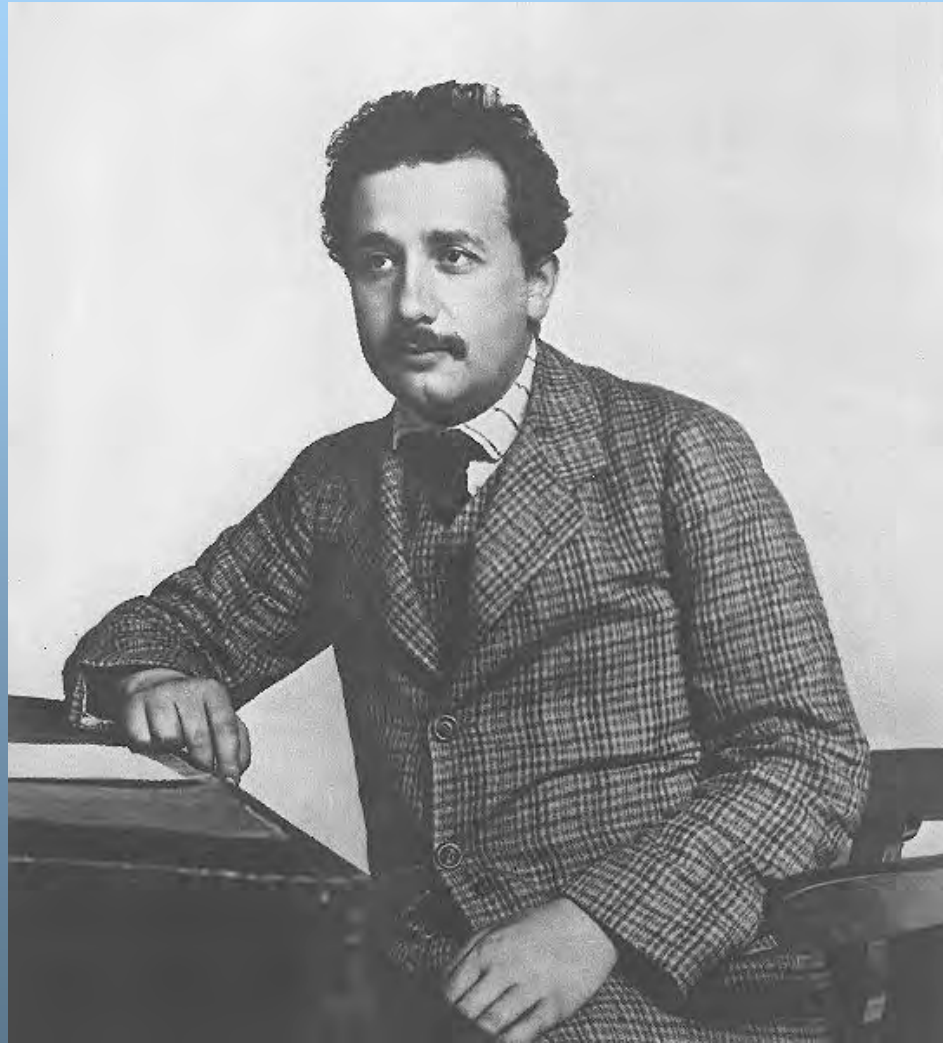
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The Miracle Year - 1905



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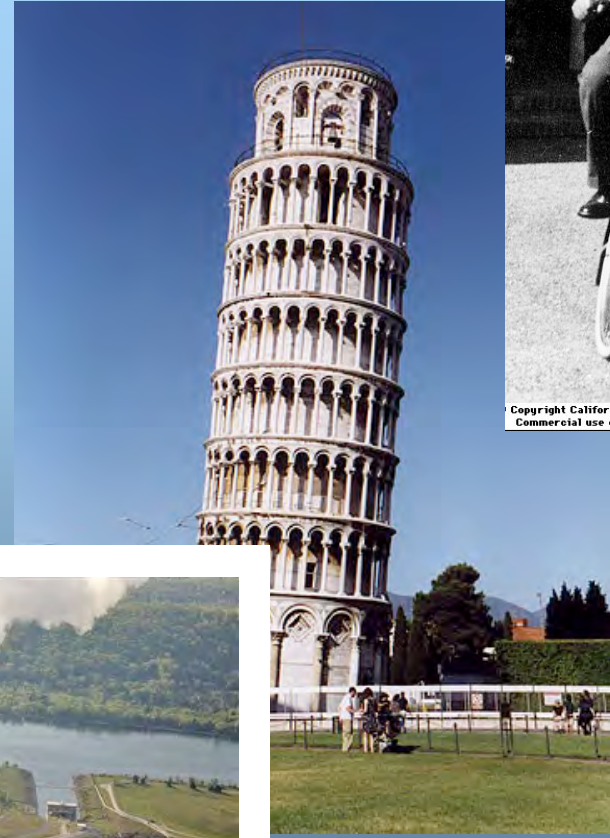
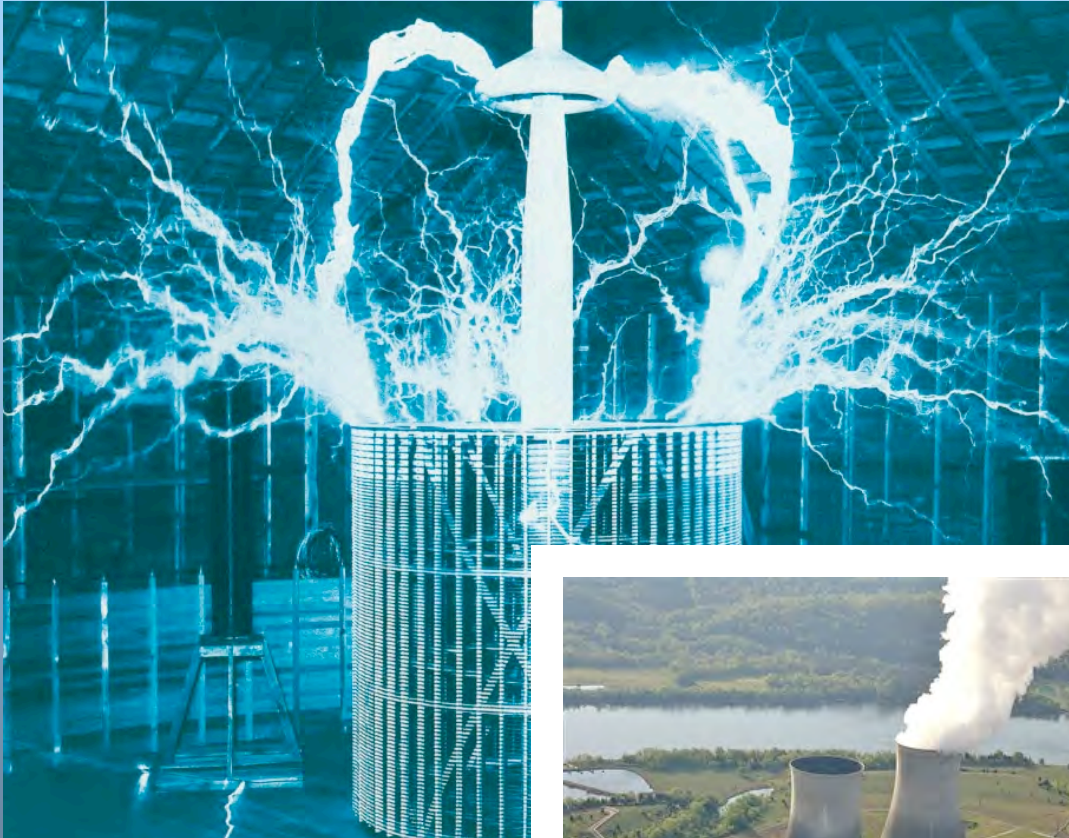
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Relativity

- When a man sits with a pretty girl for an hour, it seems like a minute.
- But let him sit on a hot stove for a minute—and it's longer than any hour.
- That's relativity.



Unification of Forces



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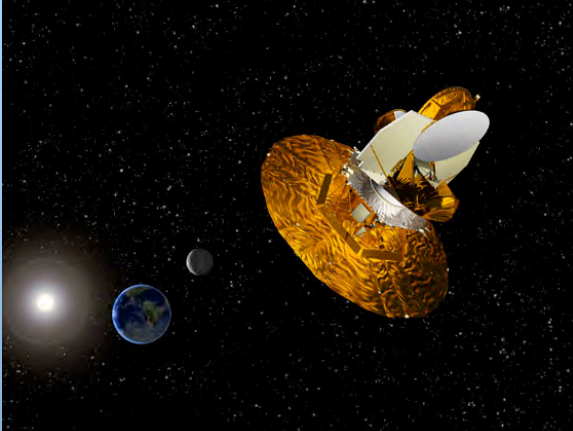
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Modern scientific instruments



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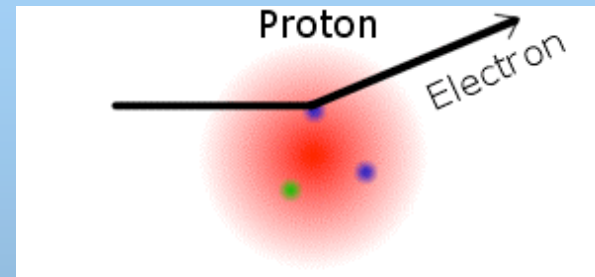
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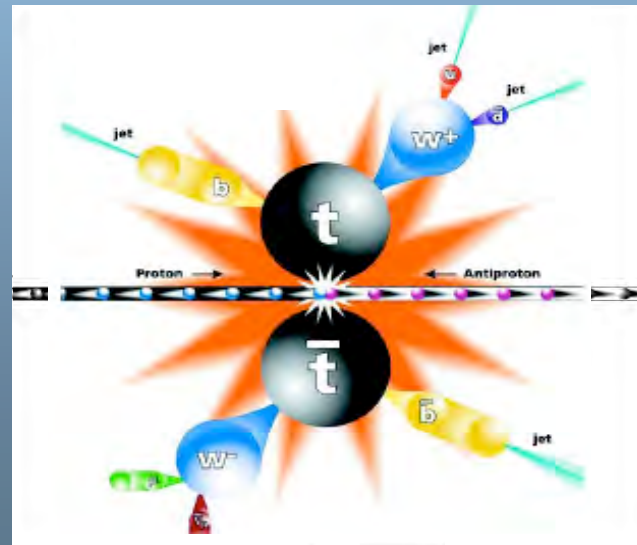
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Particle Accelerators and Colliders

1. Super-microscope



2. Creation of massive matter ($E=mc^2$)



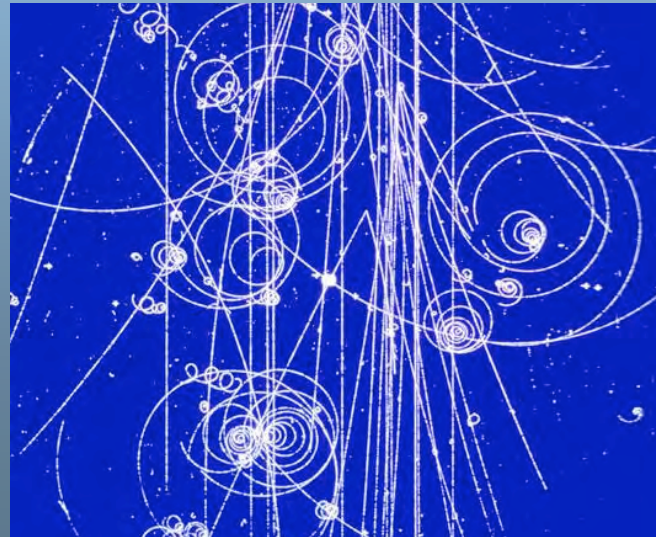
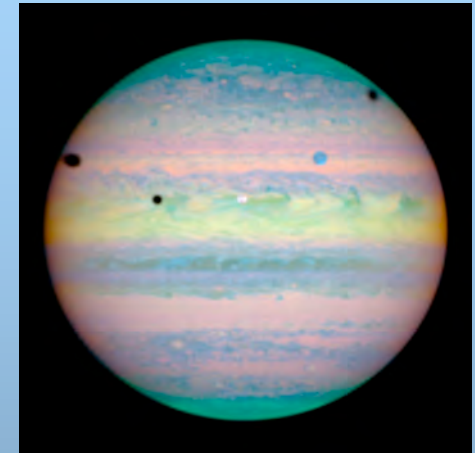
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What is matter?



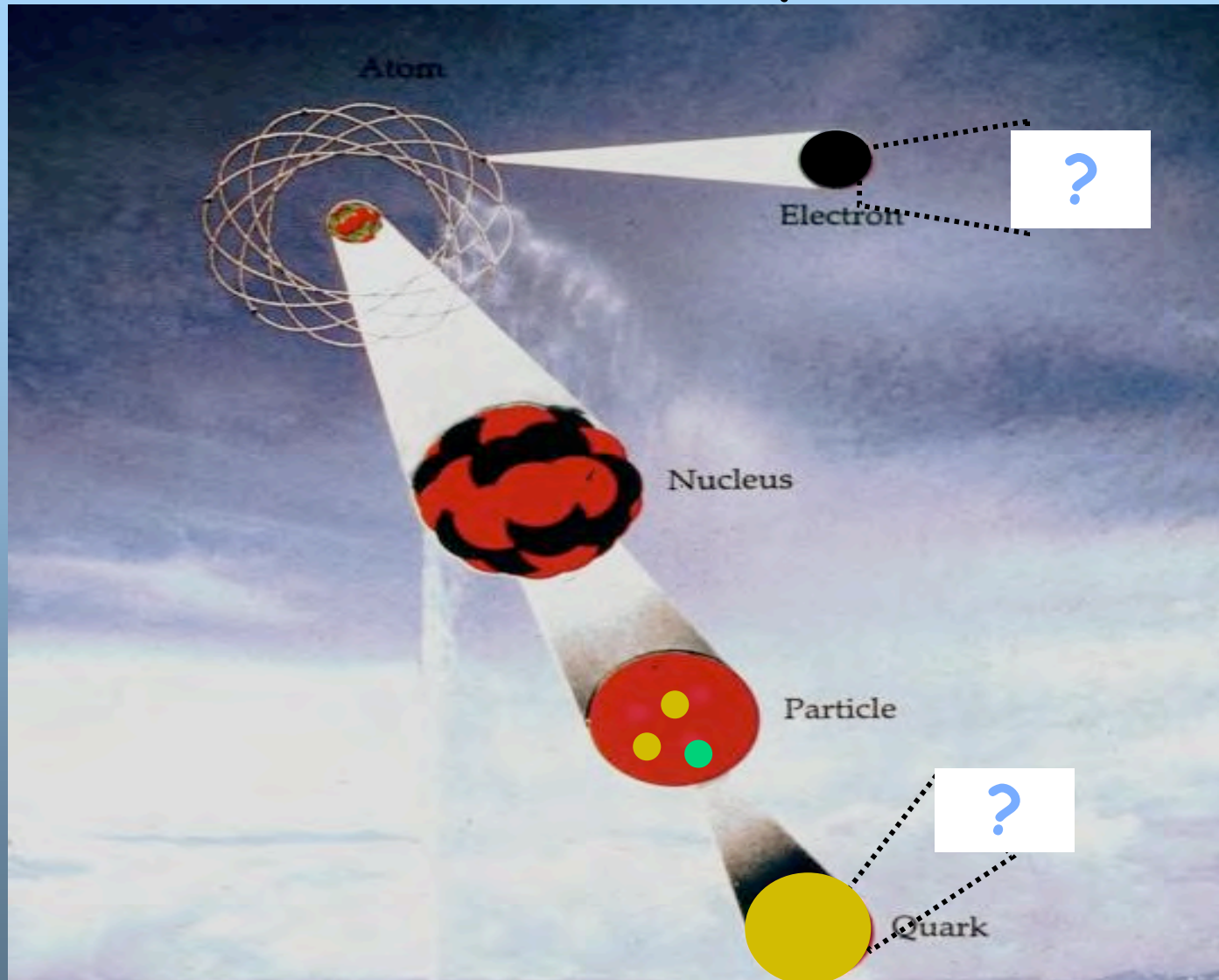
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The Structure of Matter



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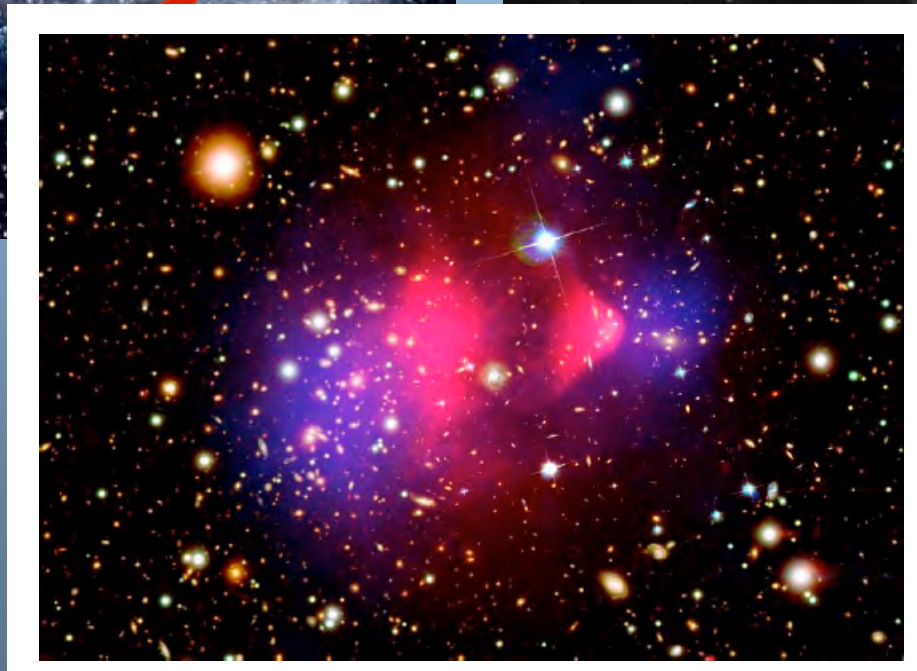
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Dark Matter



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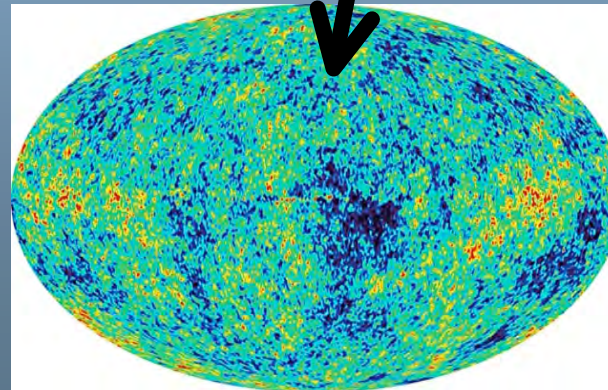
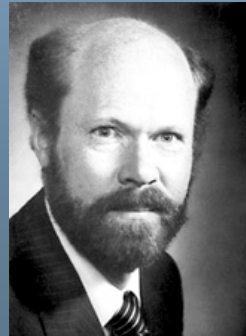
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The Cosmic Fireball



- Visible remnant of the Big Bang



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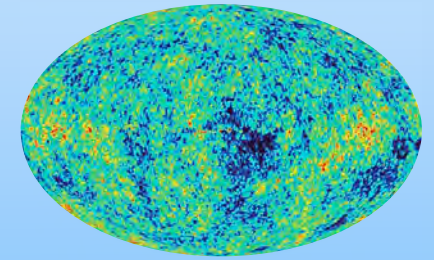
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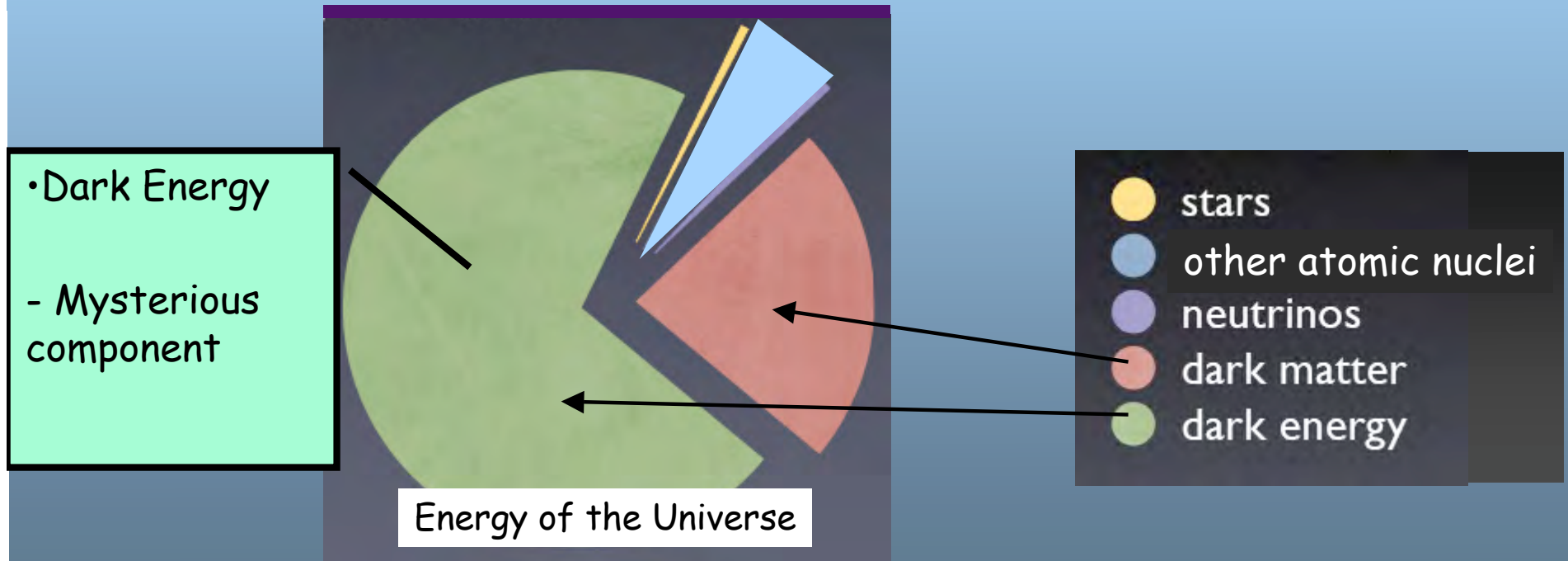
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Make-up of the Universe



- Dominately dark matter and dark energy
 - Very little anti-matter



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The Dark Side Controls the Universe

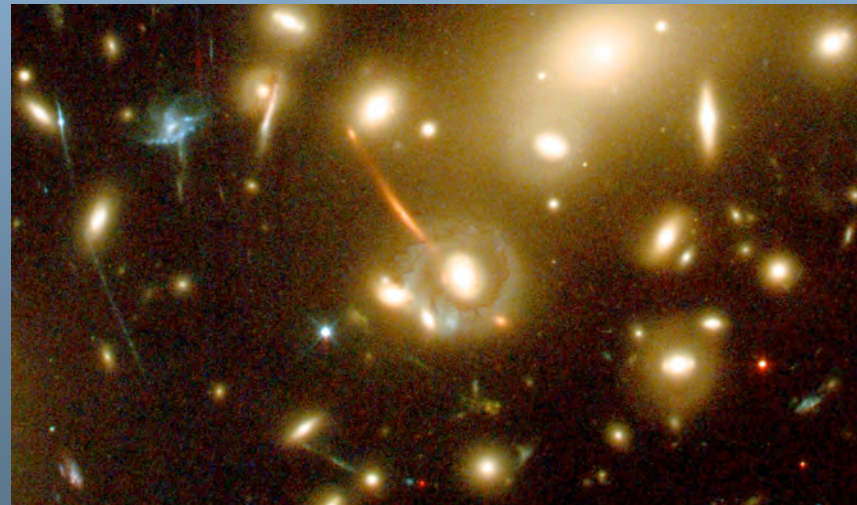


Dark Matter

HOLDS IT TOGETHER

Dark Energy

DETERMINES ITS DESTINY



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What is the Dark Matter?

POPOULAR HYPOTHESIS

SuperString Theory

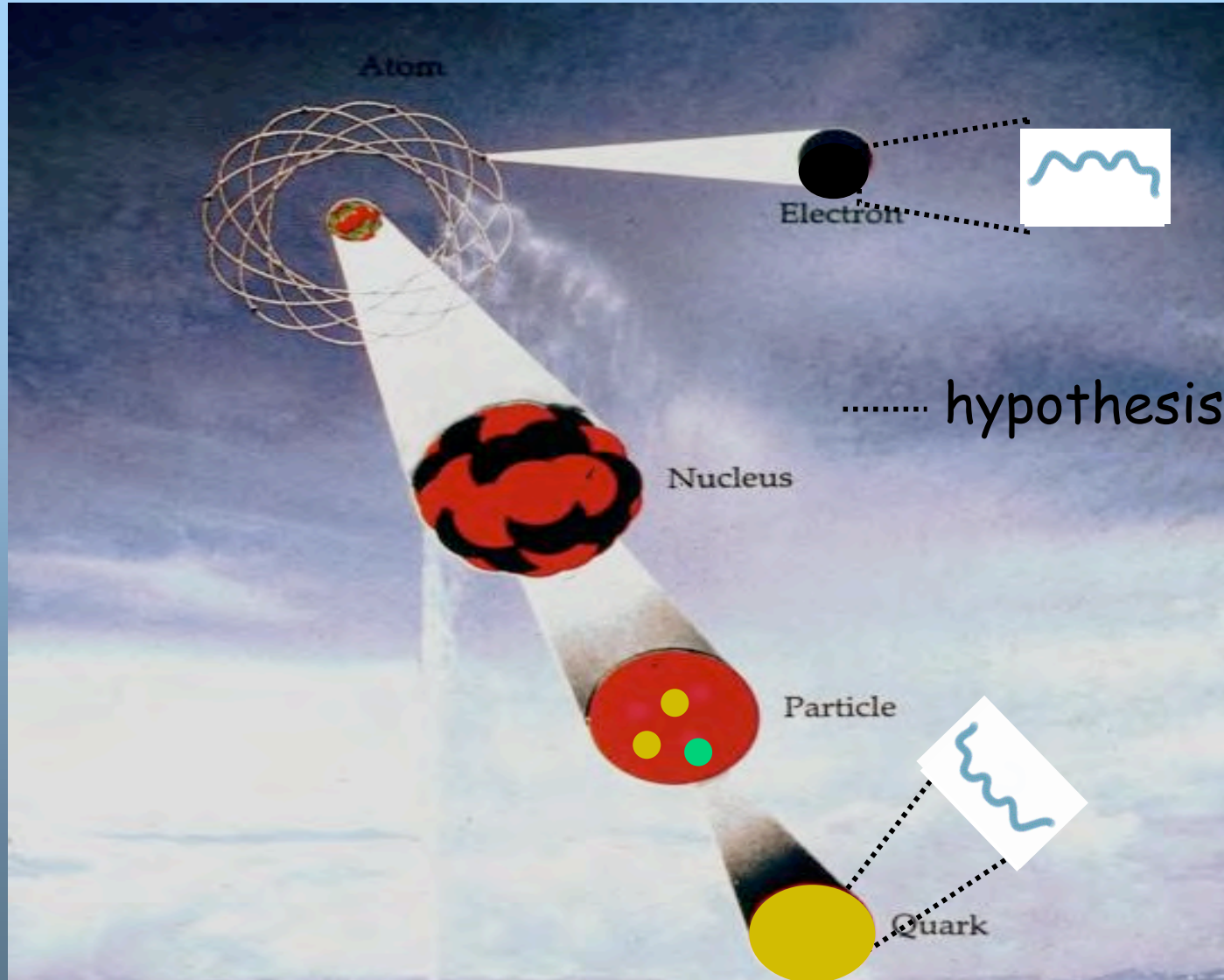


- All fundamental particles are vibrating strings
- Theory unifies all particles and all forces
 - gravity with quantum mechanics
 - String is miniscule
 - 10,000,000,000,000,000,000,000,000 x smaller than atom
 - Space is ten-dimensional (not 3D!)
 - A new set of particles are predicted
 - the super-partners of ordinary particles \Rightarrow Dark Matter ?



Particles, Energy, and Cosmology

The Structure of Matter



Particles, Energy, and Cosmology

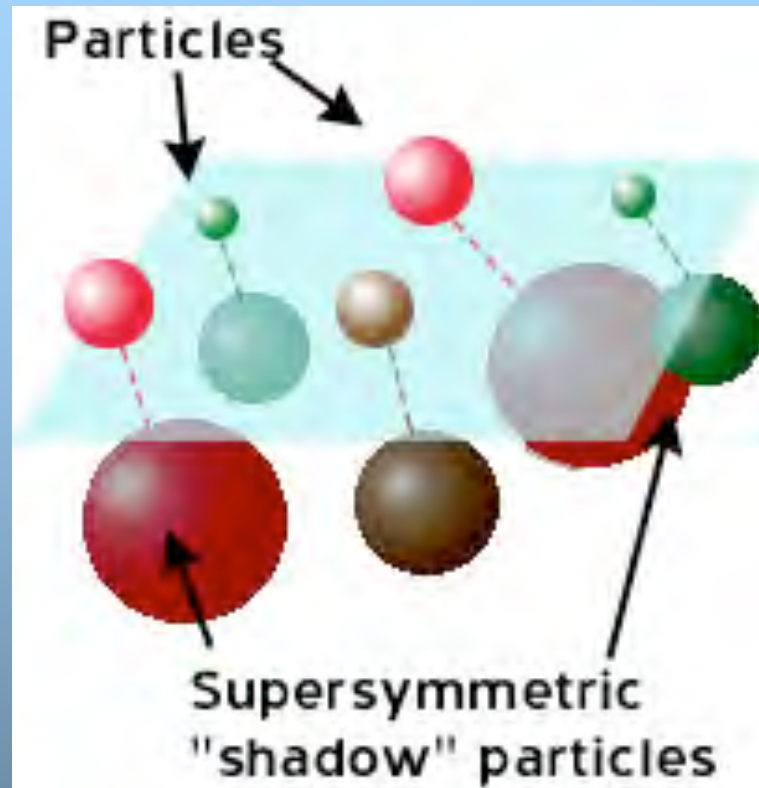
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Supersymmetry and Strings



- The supersymmetric particles have just the properties expected of Dark Matter

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Large Hadron Collider (LHC) Geneva, Switzerland



Nearing
Completion

Begins operation
later early
next year

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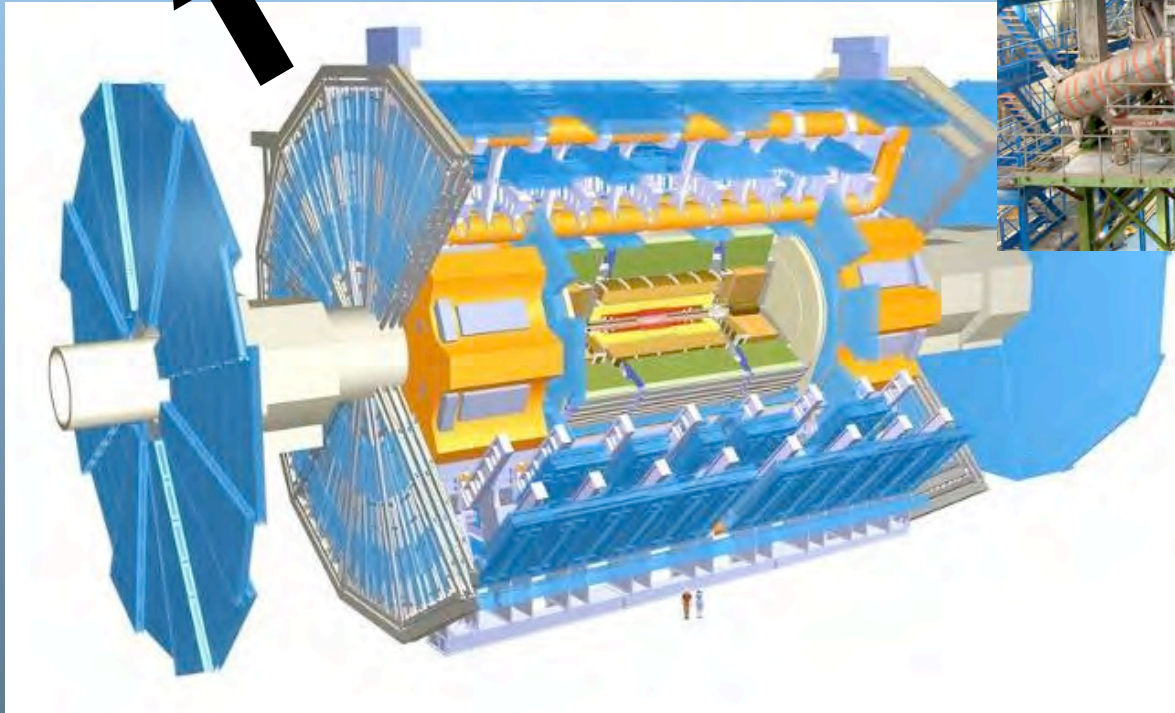
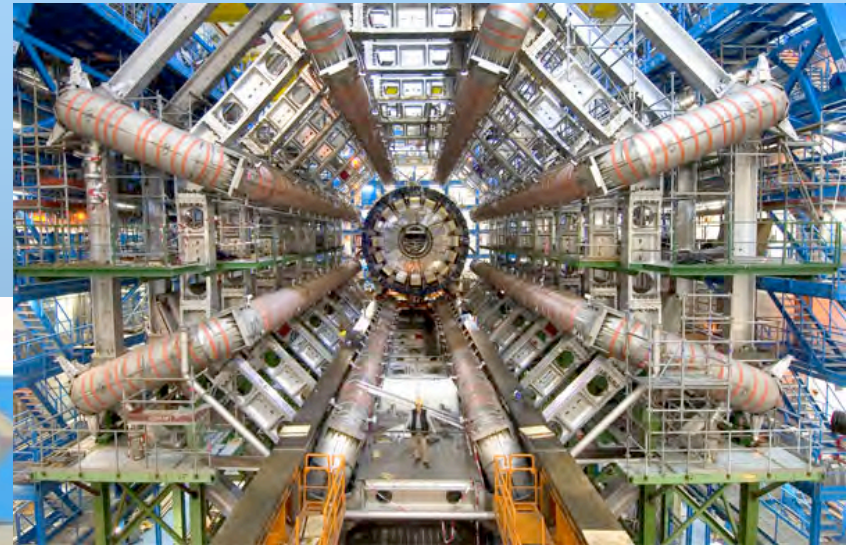
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LHC Detector - ATLAS



U. Oregon is member
institution of
ATLAS Collaboration

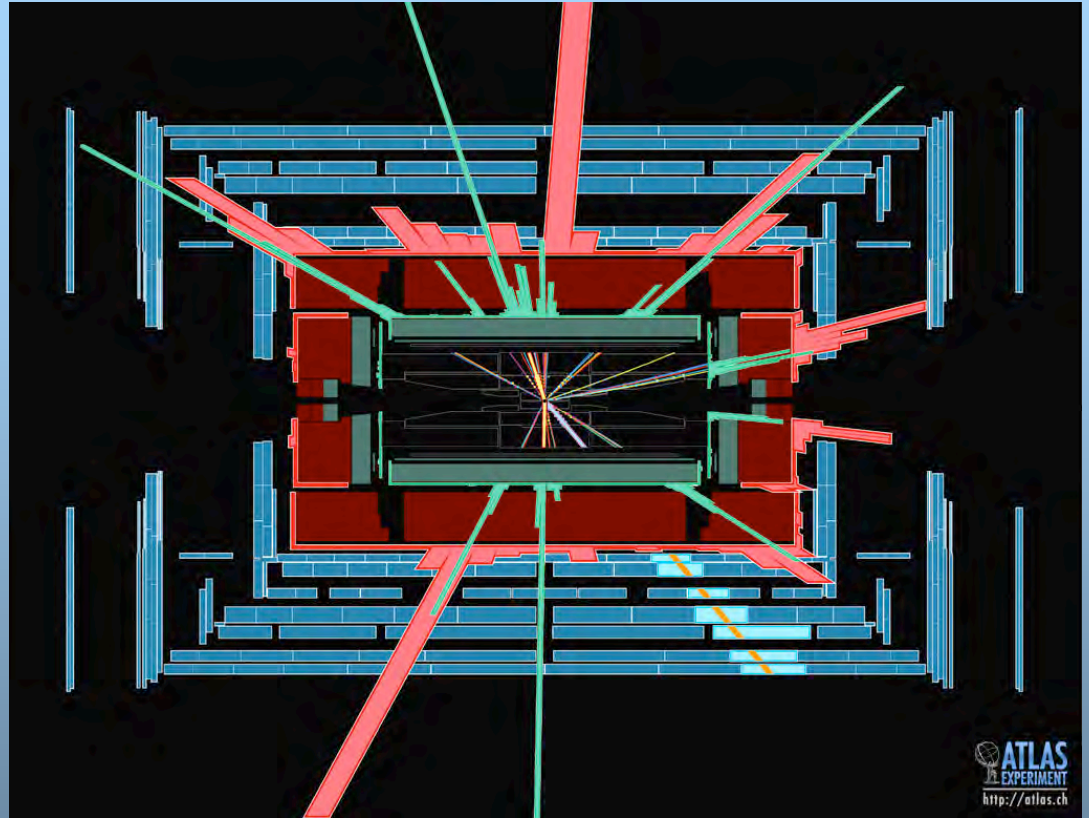
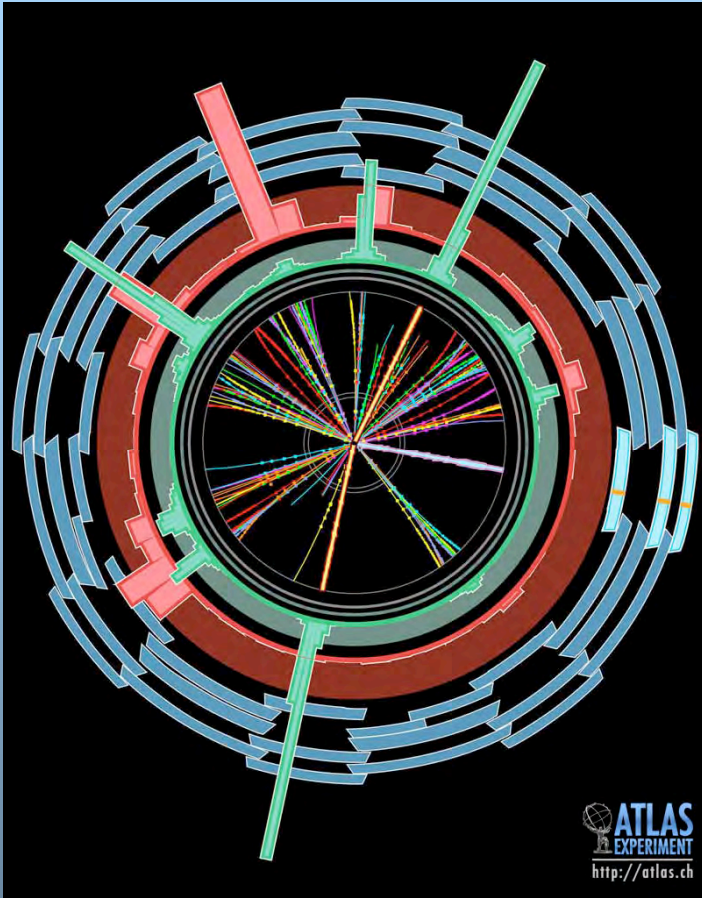
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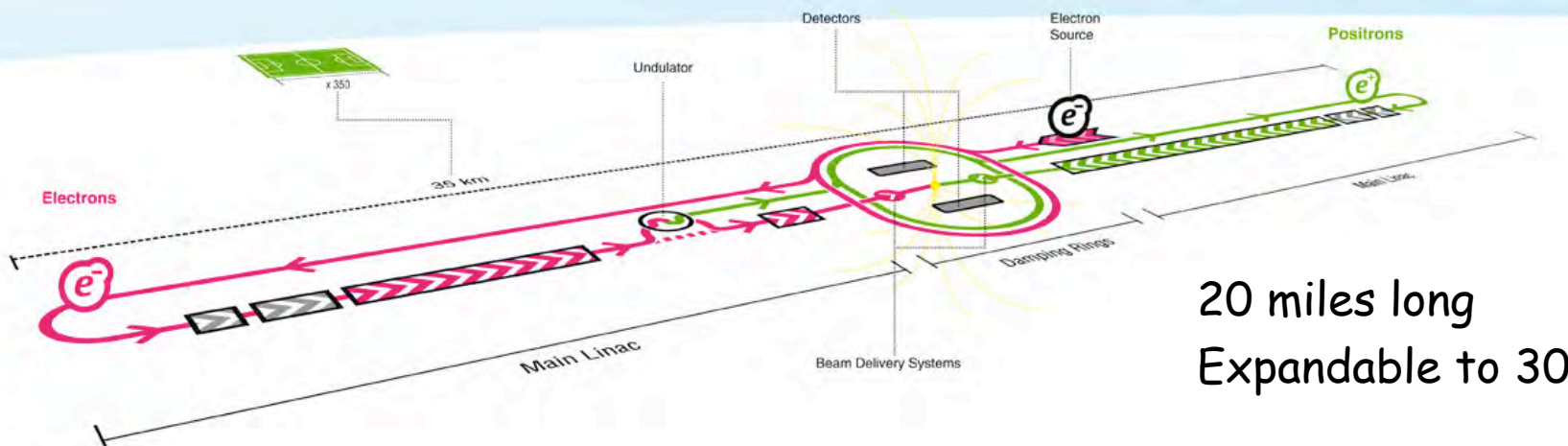
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International Linear Collider (ILC)

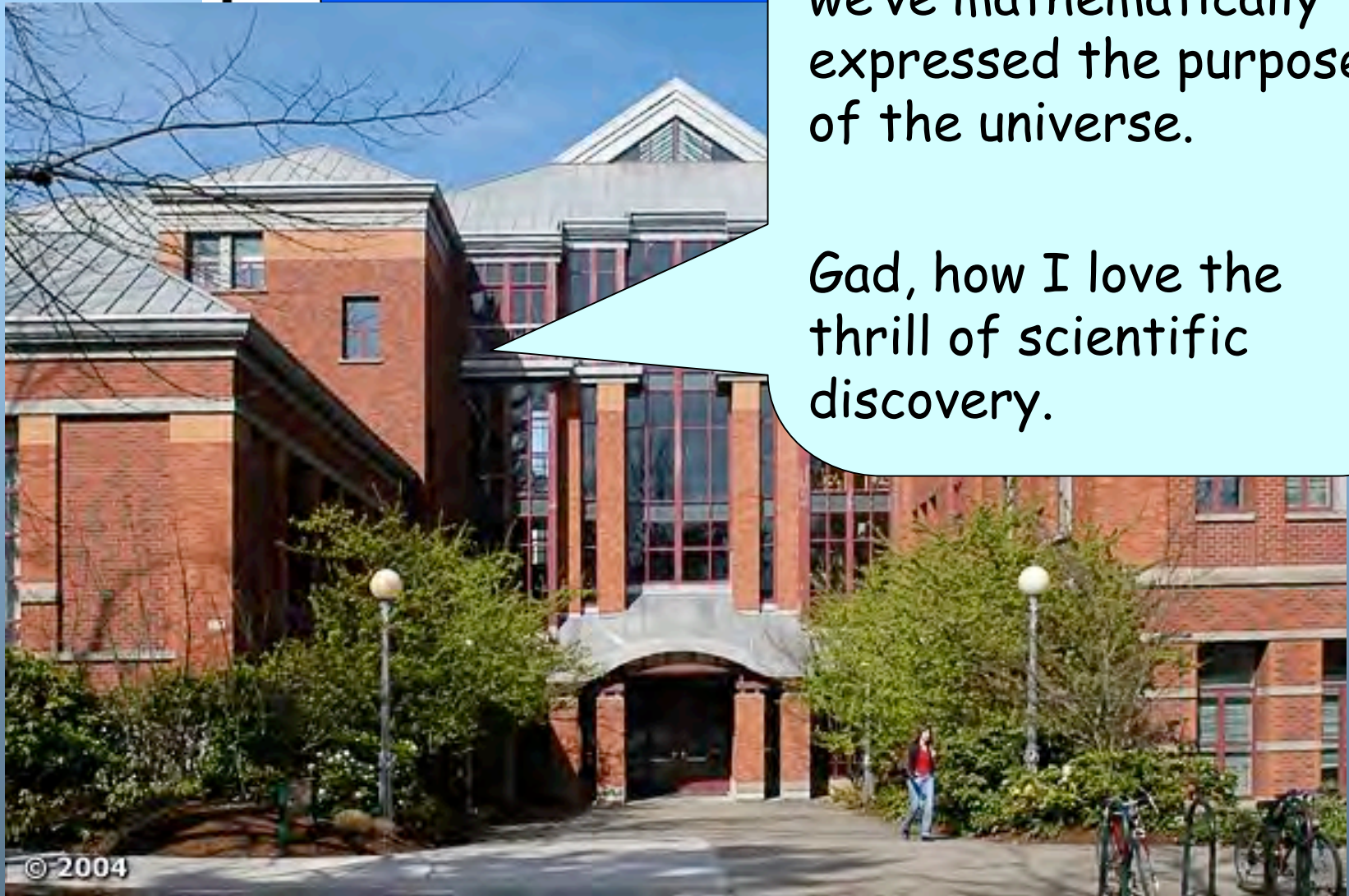


20 miles long
Expandable to 30

Under development
by global collaboration
including U. Oregon

Aim to start
construction within
several years

WILLAMETTE



No doubt about it AI -
we've mathematically
expressed the purpose
of the universe.

Gad, how I love the
thrill of scientific
discovery.

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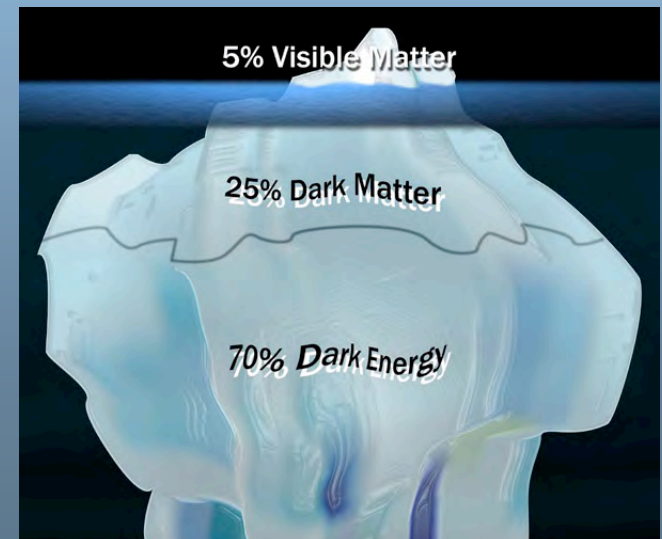
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Our Mysterious Universe

- We are on the eve of a revolution in physics
 - Many mysteries
 - Solutions appear near
 - Deeper understanding of the universe itself
- Dark Matter particles - may appear soon in particle collider experiments
- Also
 - Gravity waves
 - Higgs Boson
 - Extra Dimensions
 - Other AMAZING Things
 - The Unexpected!



Acknowledgements

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