

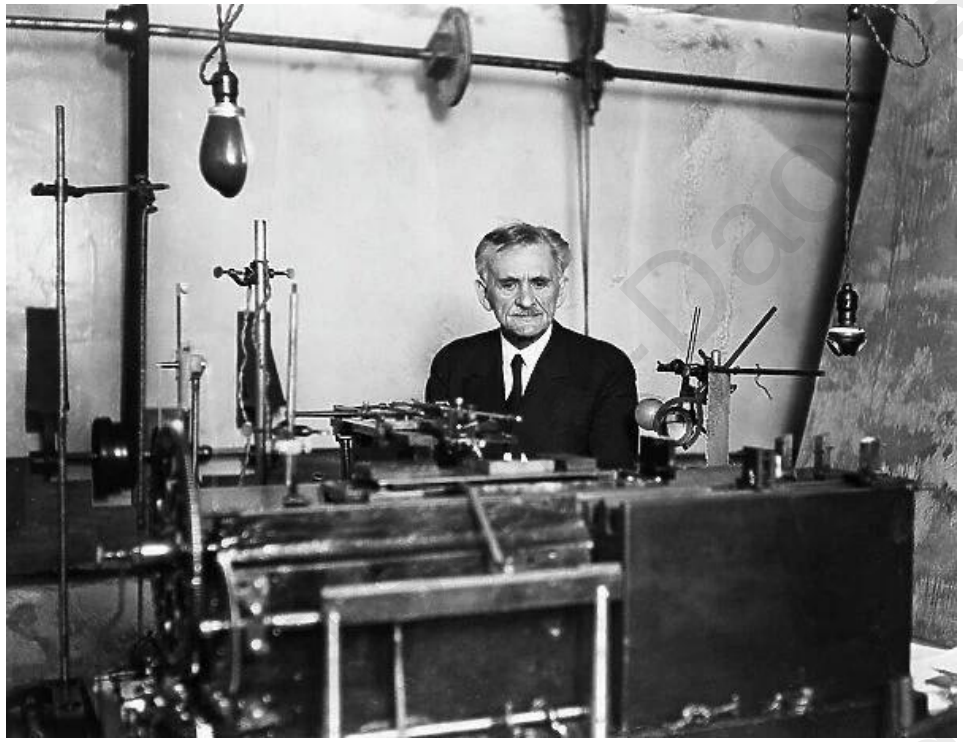
李政道研究所
TSUNG-DAO LEE INSTITUTE

From the Solvay Conference to the Shanghai Physics Symposium: A Dialogue on the Frontiers of Fundamental Physics

Shanghai Physics Symposium 2026 · Welcome Address

Jie Zhang
Director, Tsung-Dao Lee Institute | Shanghai Jiao Tong University
16 November 2026

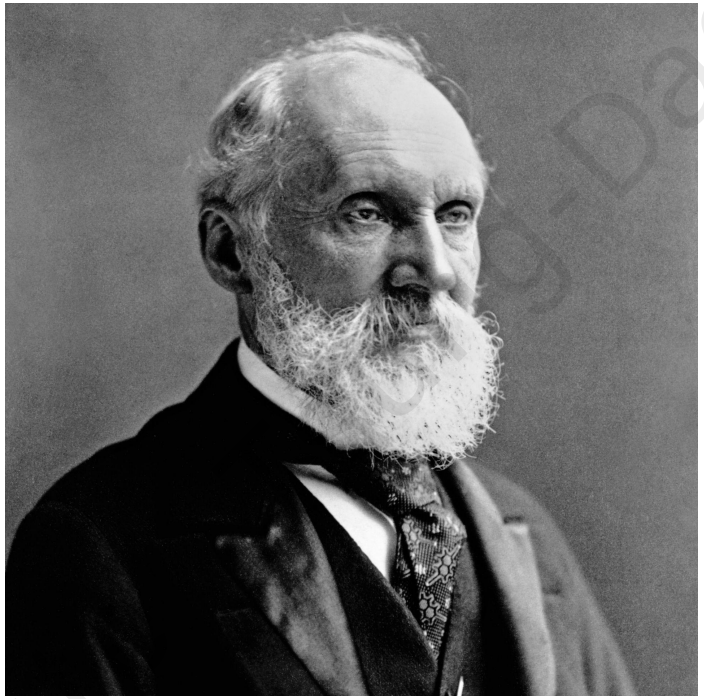
1894 · Chicago



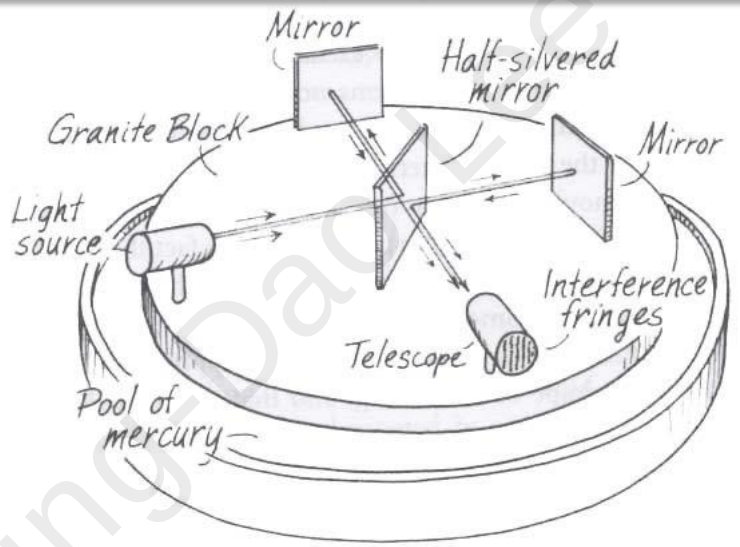
> **It seems probable that most of the grand underlying principles have now been firmly established, …**

Albert A. Michelson, Some of the Objects and Methods of Physical Science, address delivered at the dedication of the Ryerson Physical Laboratory, University of Chicago, July 4, 1894.

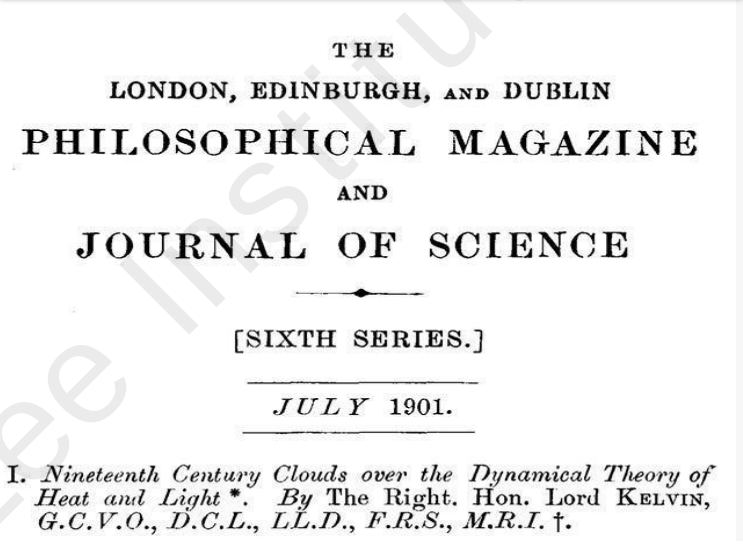
> **The beauty and clearness of the dynamical theory, which asserts heat and light to be modes of motion, is at present obscured by two clouds.**



The Ether Problem
The Michelson–Morley Experiment (1887)



The Equipartition Problem
Lord Kelvin's Original Paper (1901)



THE
LONDON, EDINBURGH, AND DUBLIN
PHILOSOPHICAL MAGAZINE
AND
JOURNAL OF SCIENCE

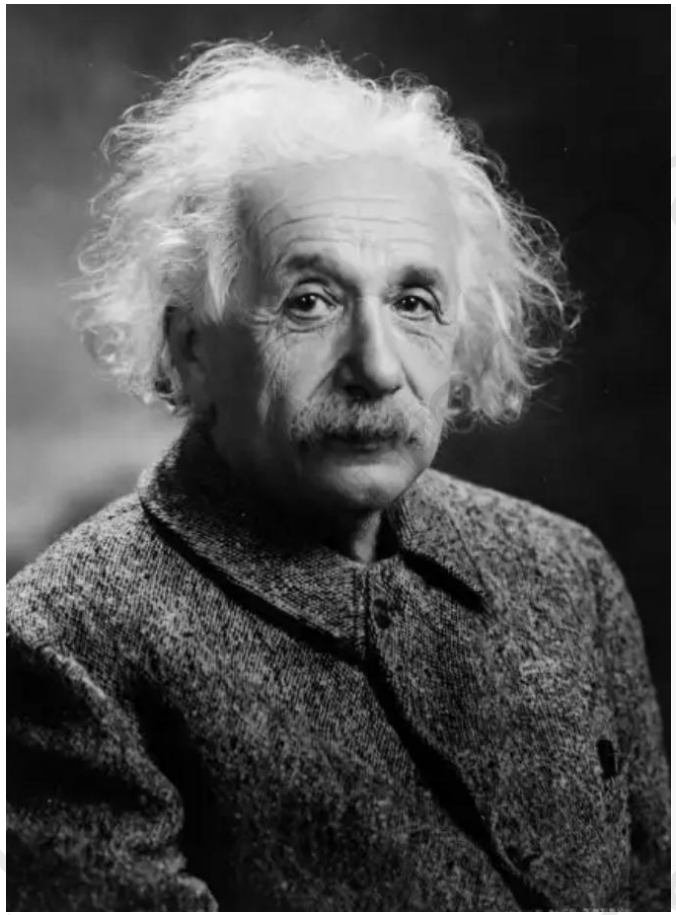
[SIXTH SERIES.]

JULY 1901.

I. *Nineteenth Century Clouds over the Dynamical Theory of Heat and Light* *. By The Right. Hon. Lord KELVIN, G.C.V.O., D.C.L., LL.D., F.R.S., M.R.I. †.

Lord Kelvin, Nineteenth Century Clouds over the Dynamical Theory of Heat and Light, lecture delivered on April 27, 1900.

Two Revolutions that Changed Physics



ALBERT EINSTEIN

Relativity

Revolutionized our understanding of space, time, and gravity.

MAX PLANCK

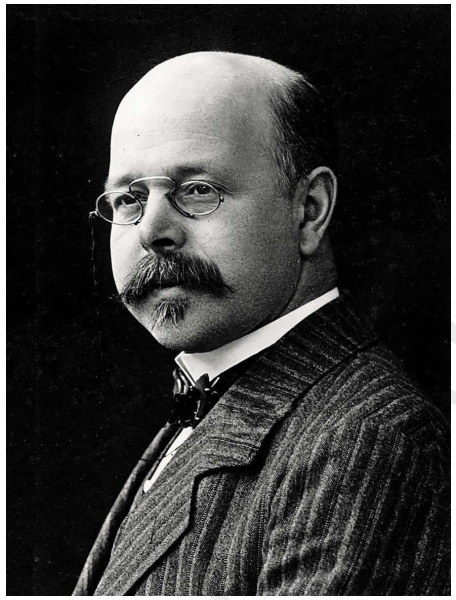
Quantum Theory

Opened the door to a new understanding of the microscopic world.



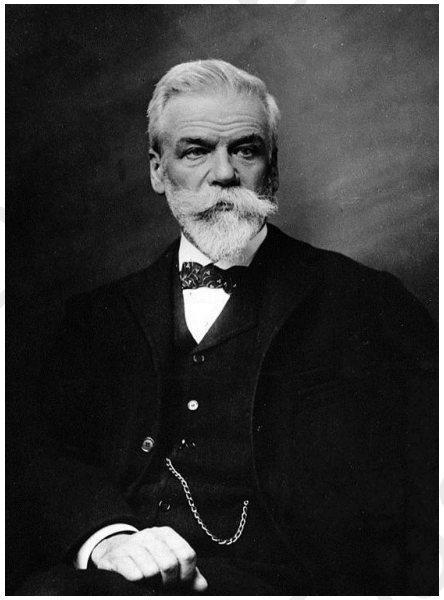
Tsung-Dao Lee Institute

Solvay 1911: A New Tradition of Scientific Dialogue



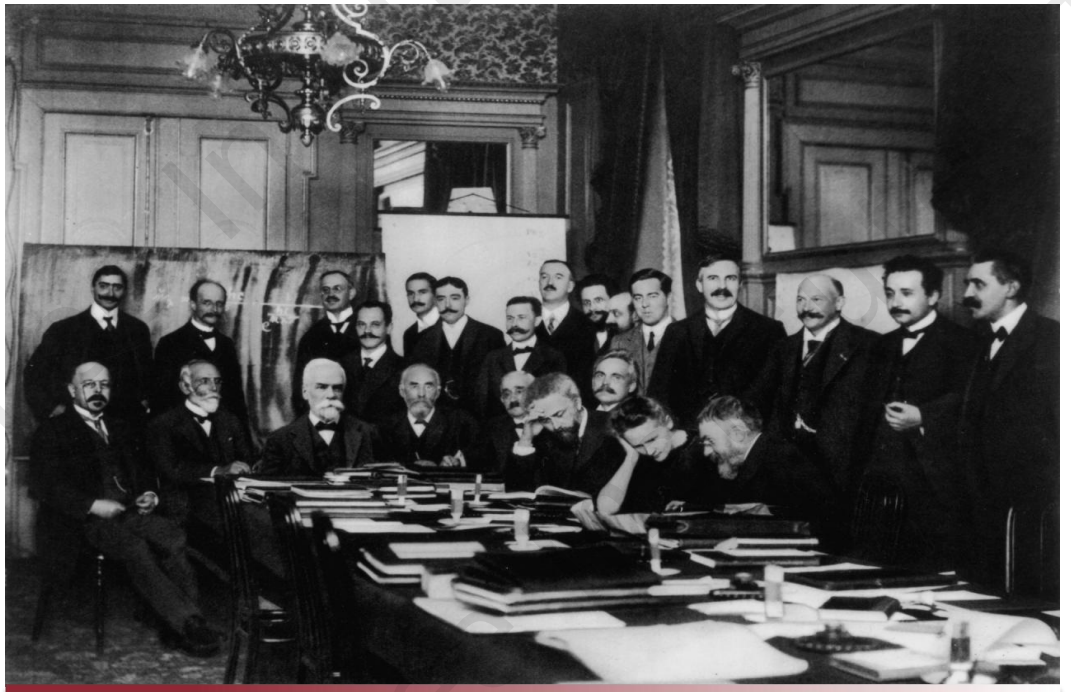
Walther Nernst

Physical Chemist
Initiator of the Solvay Conferences



Ernest Solvay

Industrialist
Founding Patron of the Solvay Conferences

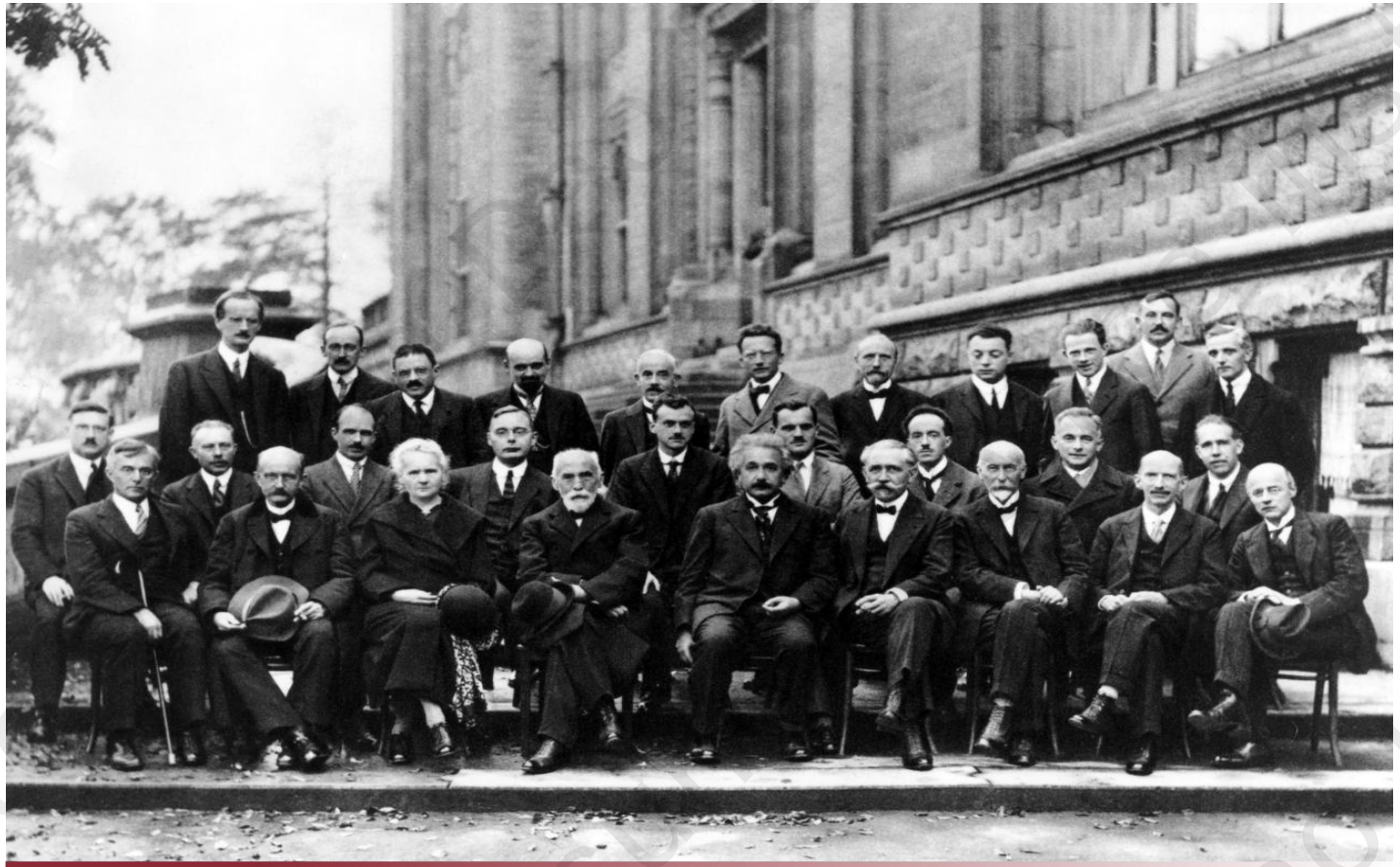


The Theory of Radiation and the Quanta

Chaired by **Hendrik Lorentz**

Focused presentations, extensive scientific discussions.

Solvay 1927: The Legendary Bohr-Einstein Debate



Electrons and Photons

Brussels, 25 October 1927 · photo by Benjamin Couprie

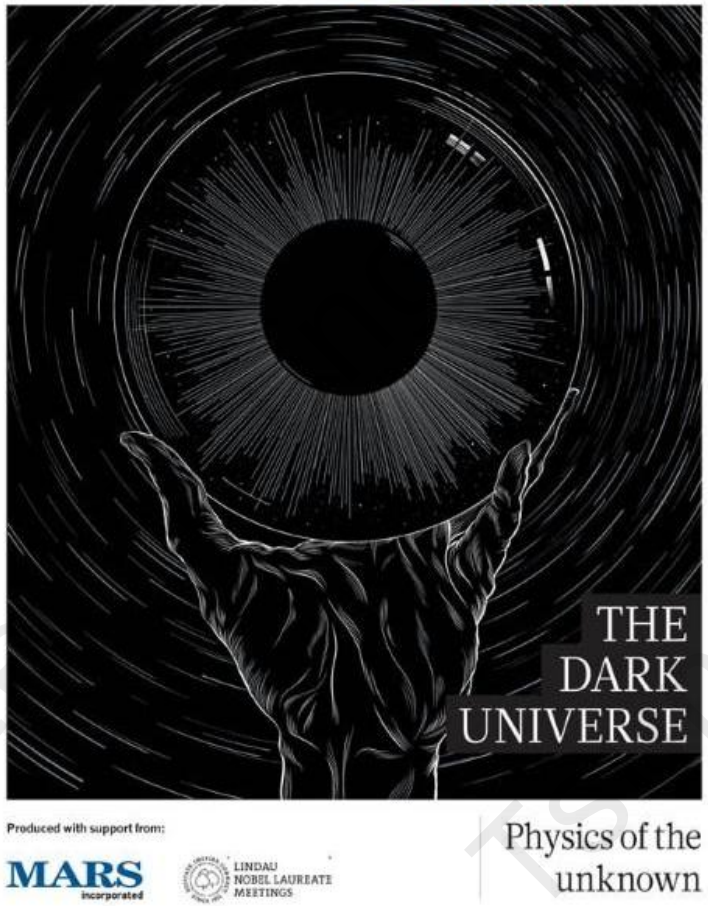
Among the 29 Participants

17

Nobel Laureates

Already laureates or later awarded the Nobel Prize

Two Clouds over Modern Physics?

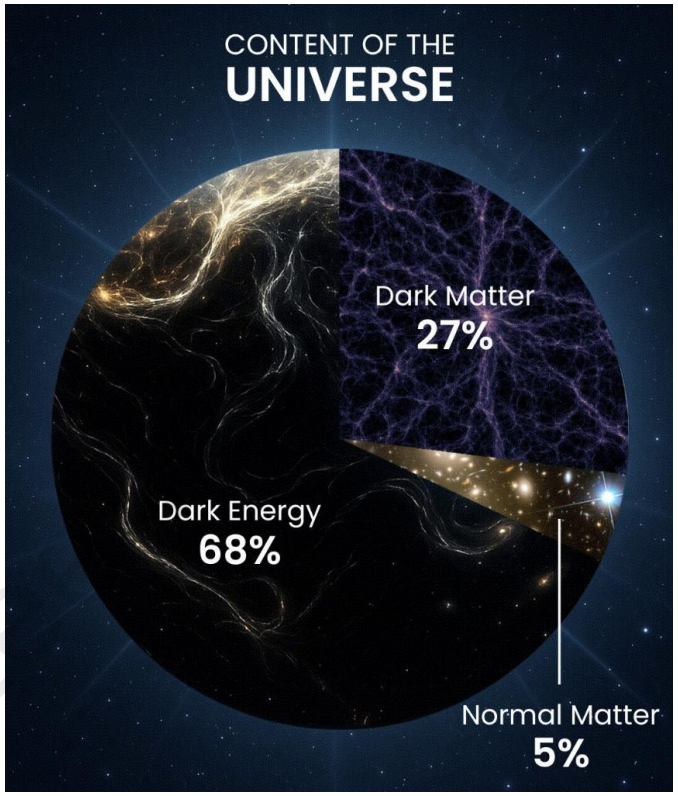


The Dark Universe

Nature Outlook · 2016

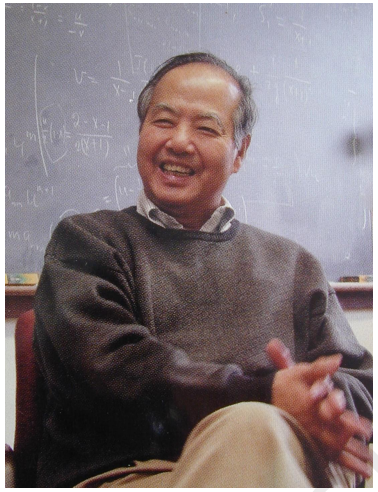
Most of the Universe Remains a Mystery

What are the nature of Dark matter and Dark energy?



ESA/Planck 2018

The Vision of T. D. Lee



Founded under Professor Tsung-Dao Lee's vision:

to build a world-leading institute for basic research in China, contributing to the global development of science and human civilization.

"A cause greater than the Nobel Prize."— T. D. Lee

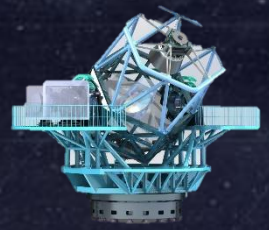


TDLI's mission: Explore the most profound laws governing nature.

Pursuing fundamental discoveries through pioneering research, advanced experiments, and international scientific collaboration.

Tsung-Dao Lee Institute

Exploring Fundamental Physics through Advanced Research Facilities



JUST Spectroscopic Telescope
Lenghu, Qinghai

- One of the best sites with clear, photometric conditions
- 4.4m diameter, dual focus
- Search dark universe, find habitable planets

Dun'huang

2,800km

2,000km

Xi'chang

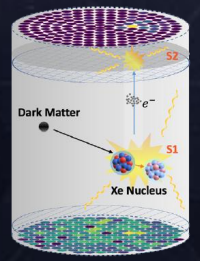
2,000km

Shanghai

Experimental Platforms and Computing Center
TDLI, Shanghai



- Experimental Platform for Laboratory Astrophysics
- Experimental Platform for Topological Quantum Computing
- High-Performance Computing Center



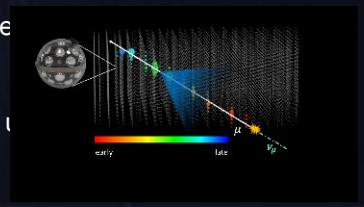
PandaX Dark Matter and Neutrino Detector
Jinping, Sichuan

- The deepest underground laboratory with an overburden of 2400m
- Multi-ton-scale PandaX liquid xenon detector
- Dark matter and neutrino detection with extremely low background

TRopIcal DEep-sea Neutrino Telescope (TRIDENT) West Pacific Ocean

Yongxing Island

- 4km*4km*0.5 km Cherenkov Telescope Array at 3500m de
- Capturing high-energy cosmic neutrinos
- Exploring the origin and fundamental laws of cosmic rays u extreme astronomical environments



How It All Began

Jie Zhang

As we look to TDLI's longterm development, how can we enhance its ***international impact*** and make Shanghai a place where ***new scientific ideas take root?***

Ye Sha

What if we brought together the world's leading scientists—not just to share results, but to ***exchange ideas across disciplines*** and explore the future of fundamental physics?

That reminds me of the ***Solvay Conferences!***



Why not bring that spirit to Shanghai? ***I'd be glad to support it.***

Let's build something that outlasts us.

Tsung-Dao Lee Institute

From 1911 to 2026



1911

A Tradition Begins

The first Solvay Conference, Brussels



1927

A Defining Dialogue

Einstein vs. Bohr on quantum physics



2026

A New Chapter

The first Shanghai Physics Symposium

Tsung-Dao Lee Institute

From Solvay Conference to Shanghai Physics Symposium

01 **Small & Focused**

Fundamental questions at the heart of every discussion.

02 **By Invitation**

Leading scientists across fields and perspectives.

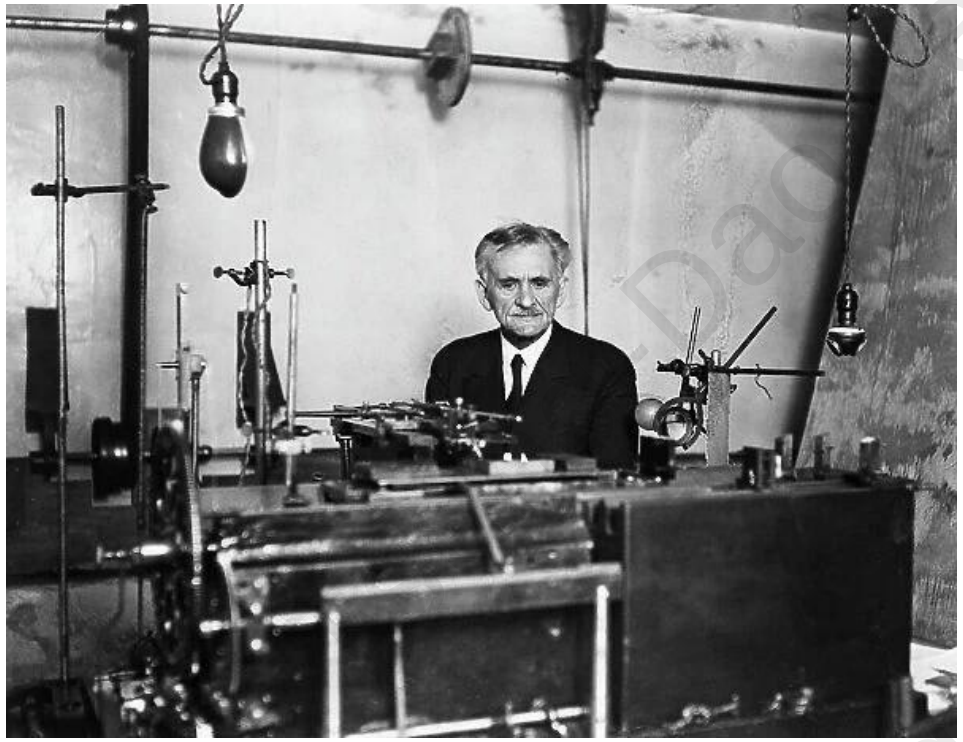
03 **Single Session**

Shared dialogue and in-depth scientific exchange.

04 **A Continuing Series**

A lasting forum for fundamental physics.

Tsung-Dao Lee Institute



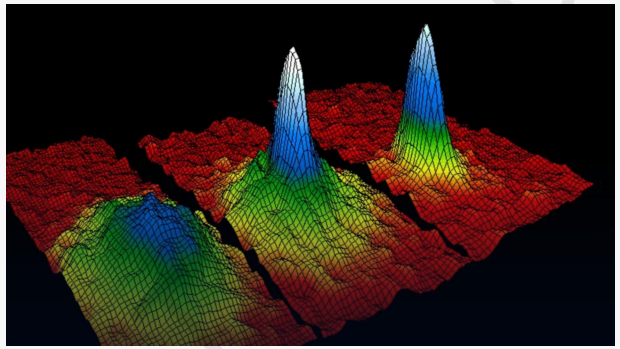
> **... It is here that the science of measurement shows its importance.**

Albert A. Michelson, Some of the Objects and Methods of Physical Science, address delivered at the dedication of the Ryerson Physical Laboratory, University of Chicago, July 4, 1894.

Fundamental Discoveries through Precision Measurements

AMO

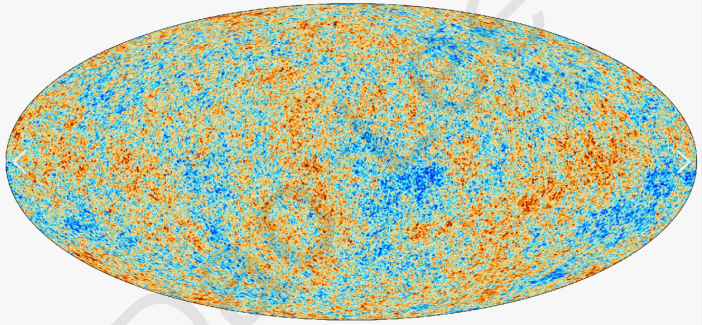
Bose–Einstein Condensation



Revealing new quantum states of matter

COSMOLOGY

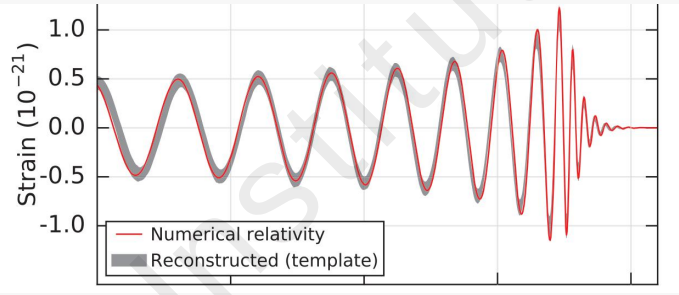
CMB Precision Mapping



Uncovering the structure and evolution of the Universe

GRAVITATIONAL WAVES

Gravitational-Wave Detection



Opening a new window on the Universe

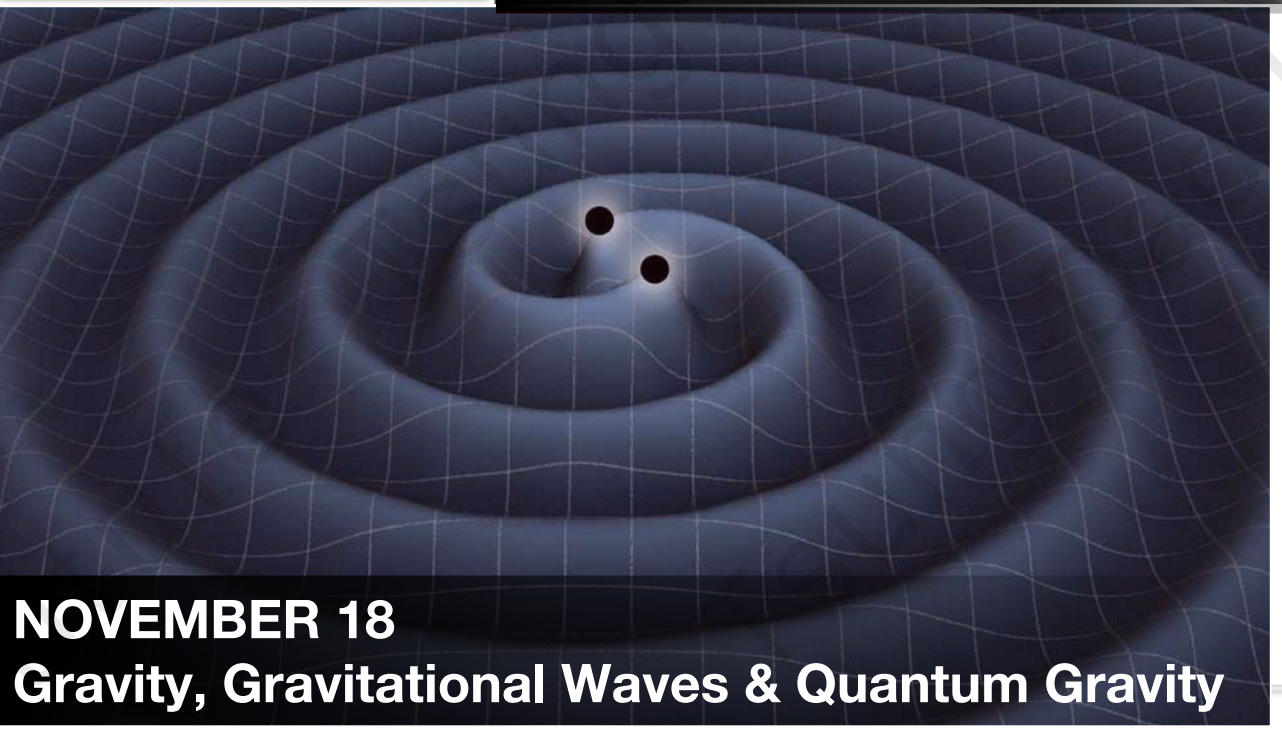
Four Days, Four Frontiers



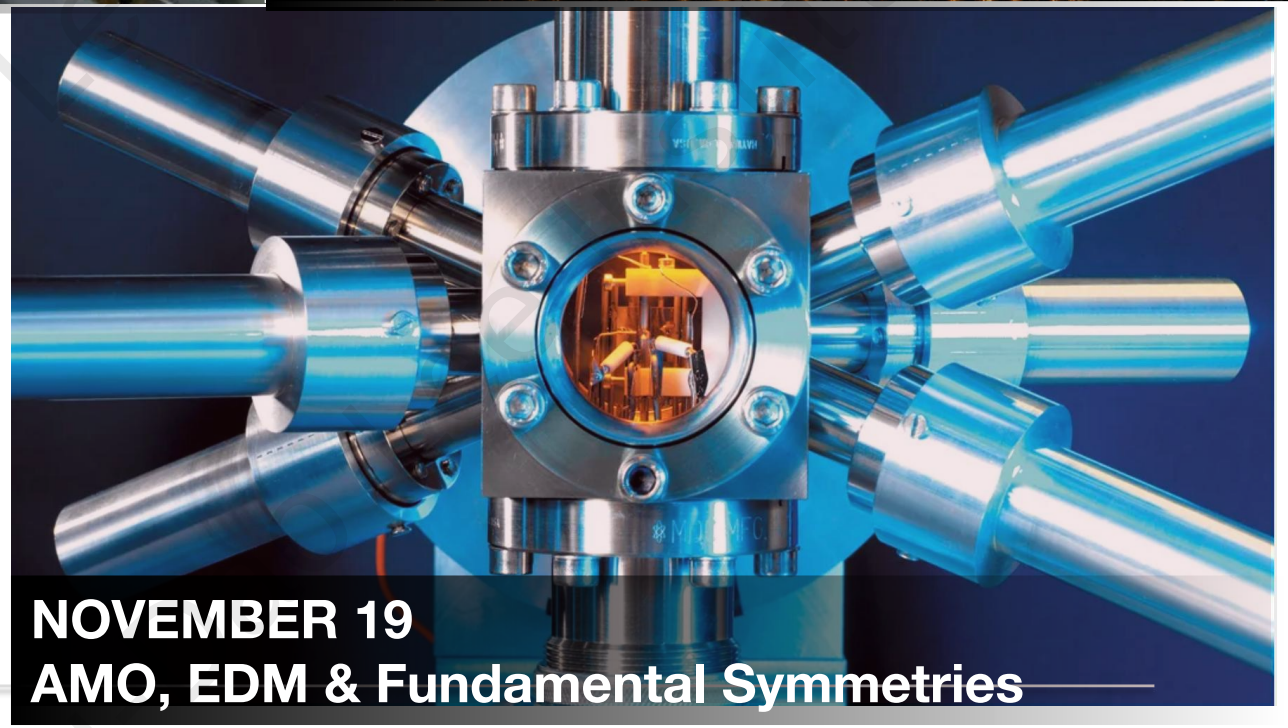
NOVEMBER 16
Dark Matter



NOVEMBER 17
Fundamental Properties of Neutrinos



NOVEMBER 18
Gravity, Gravitational Waves & Quantum Gravity



NOVEMBER 19
AMO, EDM & Fundamental Symmetries

The Solvay Tradition: 1911–2026

1911	**The Theory of Radiation and the Quanta**
1913	The structure of matter
1921	Atoms and electrons
1924	Electric conductivity of metals
1927	**Electrons and photons**
1930	Magnetism
1933	Structure and properties of the atomic nuclei
1948	Elementary particles
1951	Solid state
1954	Electrons in metals
1958	The structure and evolution of the universe
1961	Quantum Field Theory
1964	The Structure and Evolution of Galaxies
1967	Fundamental Problems in Elementary Particle Physics
1970	Symmetry Properties of Nuclei
1973	Astrophysics and Gravitation
1978	Order and Fluctuations in Equilibrium and Nonequilibrium Statistical Mechanics
1982	Higher Energy Physics
1987	Surface Science
1991	Quantum Optics
1998	Dynamical Systems and Irreversibility
2001	The Physics of Communication
2005	The Quantum Structure of Space and Time
2008	Quantum Theory of Condensed Matter
2011	The Theory of the Quantum World
2014	Astrophysics and Cosmology
2017	The Physics of Living Matter: Space, Time and Information in Biology
2022	The Physics of Quantum Information
2023	The Structure and Dynamics of Disordered Systems
2026	**Gravitational Waves: From Cosmology to Black Holes**

Tsung-Dao Lee Institute


SHANGHAI PHYSICS SYMPOSIUM 2026
A Century of Inspiration.
A New Beginning in Shanghai.
With deepest gratitude to Mr. Ye Sha for his vision and support.
李政道研究所
TSUNG-DAO LEE INSTITUTE