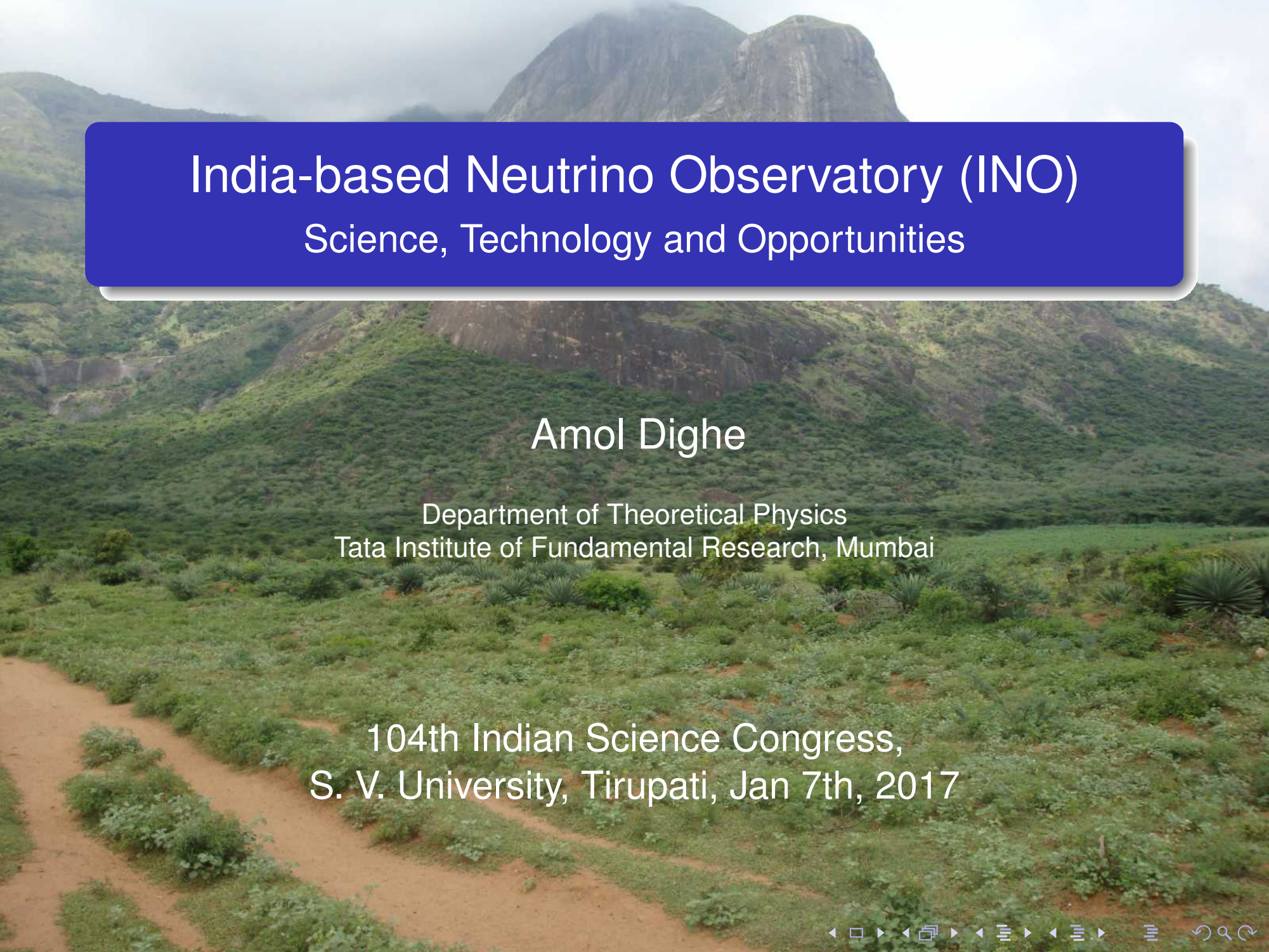


India-based Neutrino Observatory (INO)

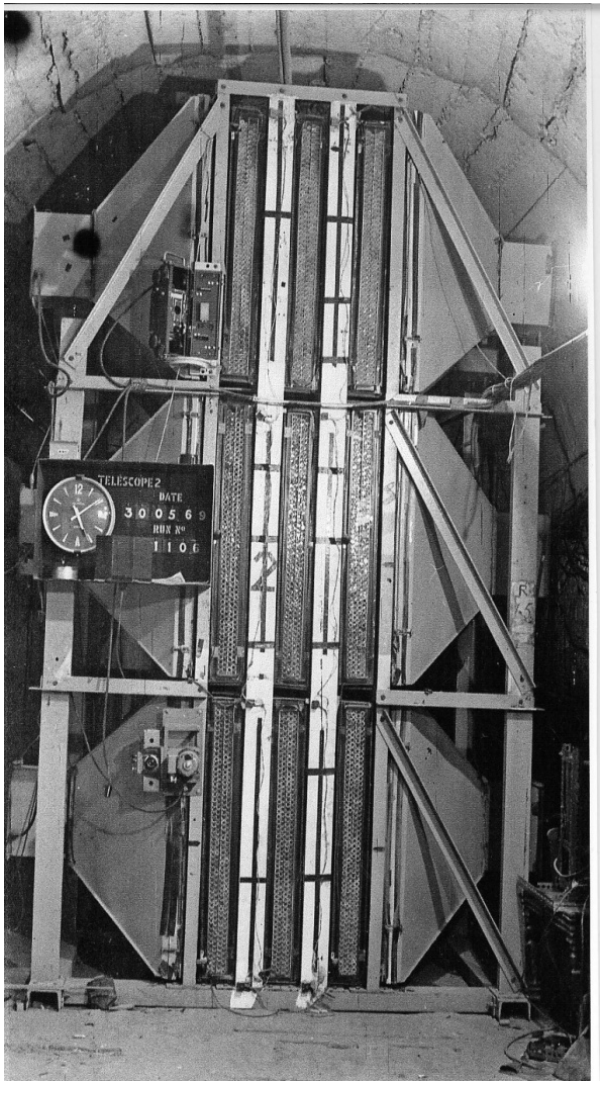
Science, Technology and Opportunities

Amol Dighe

Department of Theoretical Physics
Tata Institute of Fundamental Research, Mumbai

104th Indian Science Congress,
S. V. University, Tirupati, Jan 7th, 2017

The first detections of “atmospheric” neutrinos



Detector in
Kolar Gold Fields

DETECTION OF MUONS PRODUCED BY COSMIC RAY NEUTRINO DEEP UNDERGROUND

C. V. ACHAR, M. G. K. MENON, V. S. NARASIMHAM, P. V. RAMANA MURTHY and B. V. SREEKANTAN,
Tata Institute of Fundamental Research, Colaba, Bombay

K. HINOTANI and S. MIYAKE,
Osaka City University, Osaka, Japan

D. R. CREED, J. L. OSBORNE, J. B. M. PATTISON and A. W. WOLFENDALE
University of Durham, Durham, U.K.

Received 12 July 1965

Physics Letters 18, (1965) 196

(15th Aug 1965)

EVIDENCE FOR HIGH-ENERGY COSMIC-RAY NEUTRINO INTERACTIONS*

F. Reines, M. F. Crouch, T. L. Jenkins, W. R. Kropp, H. S. Gurr, and G. R. Smith
Case Institute of Technology, Cleveland, Ohio
and
J. P. F. Sellschop and B. Meyer
University of the Witwatersrand, Johannesburg, Republic of South Africa
(Received 26 July 1965)

PRL 15, (1965) 429

(30th Aug 1965)

Nobel Prize in Physics 2015

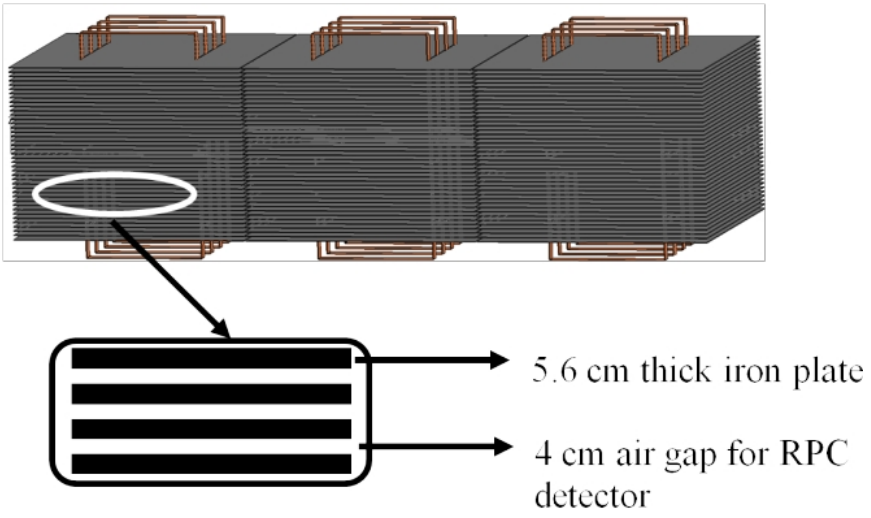
Takaki Kajita
U. of Tokyo, Japan

Arthur McDonald
Queen's U., Canada

The Citation

" ... for the discovery of neutrino oscillations,
which shows that neutrinos have mass."

Coming soon inside a mountain near you: INO



India-based Neutrino Observatory

- In a tunnel below a peak
- 1 km rock coverage from all sides
- ICAL (Iron CALorimeter) detector: 50 kiloton of magnetized iron (50 000 000 kg)
- Can distinguish neutrinos from antineutrinos
- $\gtrsim$ 25 years: a lifelong project

- Prof. S. Uma Sankar, IIT Bombay
  Neutrinos and oscilations @ INO

- Prof. Prafulla Behere, IIT Madras
  The ICAL detector

- Prof. D. Indumathi, IMSc Chennai
  Constructing an underground science megaproject in India

- Dr. B. Satyanarayana, TIFR Mumbai
  Industry interface and opportunities for students

Summarizing remarks

- Neutrino physics: many fundamental physics issues, one of the most active amd growing area of research worldwide.
- INO: a completely “Made in India” science megaproject, led and implemented by Indian scientists, engineers, industry and students.
- ICAL: the largest detector *in the world* that can distinguish neutrinos from antineutrinos. Best suited to determine the neutrino mass ordering, but has many other possibilities.
- The infrastructure of background-free underground laboratories, and the High Energy Physics Centre for instrumentation development, will have impact *far beyond the ICAL experiment*
- The need for a timely start to the project is crucial for its full impact potential to be realised. *(Worldwide competition)*