

DESY THEORY WORKSHOP

HELMHOLTZ

# HIGGS, FLAVOR AND BEYOND



27 - 30 September 2022  
DESY Hamburg, Germany

## Local Information

<http://th-workshop2022.desy.de>





# HERTZ LECTURE.

DESY Lecture on Physics 2022

## Where do we come from? Perspective from Physics

Prof. Dr. Hitoshi Murayama

- Berkeley Center for Theoretical Physics  
University of California, USA
- Lawrence Berkeley National Laboratory  
Berkeley, USA
- Kavli IPMU, University of Tokyo  
Kashiwa, Japan

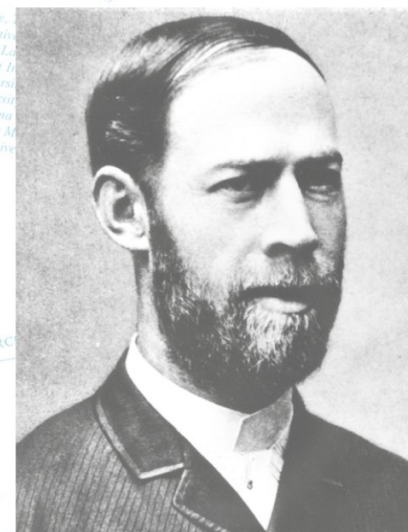
September 28, 17:45 h

DESY main auditorium

<https://webcast.desy.de>

Deutsches Elektronen-Synchrotron DESY  
A Research Centre of the Helmholtz Association

It has been a millennia-long question by the human beings, traditionally in the context of religions, philosophy, literature, and art. In recent decades, physics made strides to come up with partial answers to this question. Chemical elements we are made of came from exploding stars, as observed by neutrinos and gravitational waves. Stars were born out of dark matter. Our original seeds came from inflation. I also discuss what progress we anticipate in the near and more distant future.



Heinrich Hertz  
1857 Hamburg-Karlsruhe-Bonn 1894



VOLUME 90, NUMBER 2 PHYSICAL REVIEW LETTERS

### First Results from KamLAND: Evidence for Reactor Antineutrino Disappearance

K. Eguchi,<sup>1</sup> S. Enomoto,<sup>1</sup> K. Furuno,<sup>1</sup> J. Goldman,<sup>1</sup> H. Hanada,<sup>1</sup> H. Ikeda,<sup>1</sup> K. Inoue,<sup>1</sup> K. Ishihara,<sup>1</sup> W. Itoh,<sup>1</sup> T. Iwamoto,<sup>1</sup> T. Kawaguchi,<sup>1</sup> T. Kawashima,<sup>1</sup> H. Kinoshita,<sup>1</sup> Y. Kishimoto,<sup>1</sup> M. Koga,<sup>1</sup> Y. Koseki,<sup>1</sup> T. Maeda,<sup>1</sup> T. Mitsui,<sup>1</sup> M. Motoki,<sup>1</sup> K. Nakajima,<sup>1</sup> M. Nakajima,<sup>1</sup> T. Nakajima,<sup>1</sup> H. Ogawa,<sup>1</sup> K. Owada,<sup>1</sup> T. Sakabe,<sup>1</sup> I. Shimizu,<sup>1</sup> J. Shirai,<sup>1</sup> F. Suekane,<sup>1</sup> A. Suzuki,<sup>1</sup> K. Tada,<sup>1</sup> O. Tajima,<sup>1</sup> T. Takayama,<sup>1</sup> K. Tamae,<sup>1</sup> H. Watanabe,<sup>1</sup> J. Busenitz,<sup>2</sup> Z. Djuricic,<sup>2</sup> K. McKinney,<sup>2</sup> D.-M. Mei,<sup>2</sup> A. Piepke,<sup>2</sup> E. Yakushev,<sup>2</sup> B. E. Berger,<sup>2</sup> Y. D. Chan,<sup>2</sup> M. P. Decowski,<sup>2</sup> D. A. Dwyer,<sup>2</sup> S. J. Freedman,<sup>3</sup> Y. Fu,<sup>3</sup> B. K. Fujikawa,<sup>3</sup> K. M. Heeger,<sup>3</sup> K. T. Lesko,<sup>3</sup> G. A. Winslow,<sup>3</sup> K.-B. Luk,<sup>3</sup> H. Murayama,<sup>3</sup> D. R. Nygren,<sup>3</sup> C. E. Okada,<sup>4</sup> A. W. P. Poon,<sup>4</sup> H. M. Steiner,<sup>4</sup> L. A. Winslow,<sup>4</sup> G. A. Horton-Smith,<sup>4</sup> R. D. McKeown,<sup>4</sup> J. Ritter,<sup>4</sup> B. Tipton,<sup>4</sup> P. Vogel,<sup>4</sup> C. E. Lane,<sup>5</sup> T. Miletic,<sup>5</sup> P. W. Gorham,<sup>6</sup> G. Guillian,<sup>6</sup> J. G. Learned,<sup>6</sup> J. Maricic,<sup>6</sup> S. Matsuno,<sup>6</sup> S. Pakvasa,<sup>6</sup> S. Dazeley,<sup>7</sup> S. Hatakeyama,<sup>7</sup> M. Murakami,<sup>7</sup> R. C. Svoboda,<sup>7</sup> B. D. Dieterle,<sup>8</sup> M. DiMauro,<sup>8</sup> J. Derwiler,<sup>9</sup> G. Gratta,<sup>9</sup> K. Ishii,<sup>9</sup> N. Tolich,<sup>9</sup> Y. Uchida,<sup>9</sup> M. Batygov,<sup>10</sup> W. Buge,<sup>10</sup> H. Cohn,<sup>10</sup> Y. Efremenko,<sup>10</sup> D. M. Markoff,<sup>10</sup> J. A. Messimore,<sup>10</sup> A. Kozlov,<sup>10</sup> Y. Nakamura,<sup>10</sup> L. De Braeckeleer,<sup>11</sup> C. R. Gould,<sup>11</sup> H. J. Karwowski,<sup>11</sup> W. Tornow,<sup>11</sup> A. R. Young,<sup>11</sup> and Y.-F. Wang<sup>12</sup>

(KamLAND Collaboration)

VOLUME 70, NUMBER 13 PHYSICAL REVIEW LETTERS

### Chaotic Inflation and Baryogenesis by Right-Handed Sneutrinos

H. Murayama, Hiroshi Suzuki, and T. Yanagida  
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Jun-ichi Yokoyama  
Uji Research Center, Yukawa Institute for Theoretical Physics, Kyoto University, Uji 611, Japan  
(Received 23 November 1992)

We present a model of chaotic inflation driven by the superpartner of the right-handed neutrino ( $\tilde{\nu}_R$ ). This model gives the correct magnitude of the density perturbation observed by the Cosmic Background Explorer satellite with a right-handed neutrino mass  $\approx 10^5$  GeV, which is also preferred by the Mikheyev-Smirnov-Wolfenstein solution to the solar neutrino problem. The reheating process is the decay of the coherently oscillating  $\tilde{\nu}_R$ . This decay process also generates lepton asymmetry via  $CP$  violation, which will be converted to baryon asymmetry thanks to the electroweak anomaly. This model can incorporate the  $\tau$ -neutrino mass  $\approx 10$  eV.

PACS numbers: 98.80.Cq, 05.45.+b, 14.60.Gh, 14.80.Ly

The inflationary expansion in the early Universe is a desirable ingredient of modern cosmology to solve the horizon and the flatness puzzles [1] as well as the monopole [2], the domain-structure [3], and the gravitino problems [4]. Recently, the Cosmic Background Explorer (COBE) satellite [5] detected an anisotropy of the cosmic microwave background, and found that it is consistent with the almost scale-invariant density perturbation generated by the quantum fluctuations during the infla-

we have to take the SUSY standard model as a serious candidate to describe the nature below the Planck (or unification) scale. It is natural to seek for a candidate of the inflaton among scalar partners of the fermion species whose existence is known or suggested by experimental basis.

In this Letter we propose a scenario of chaotic inflation [13] by identifying the inflaton with the scalar partner of a right-handed Majorana neutrino. Being gauge singlet,

# Zoom & webcasts

- All sessions will have a zoom meeting
  - The plenary zoom info is:

<https://desy.zoom.us/j/8029125821?pwd=WE9MT256cm9yVWNIbURpZ3QrcDhLZz09>

- The parallel zoom info will be sent by the track conveners (but not all parallel sessions will be broadcast)
- The Hertz lecture will be webcast: <https://webcast.desy.de/>



# Please upload your talks to indico

- We would very much appreciate it if you could do this yourselves *before* your session
- If this is not possible due to rights issues, please email your talk to:
  - Plenaries: Fady Bishara & Juergen Reuter
  - Parallels: the conveners of your track

<https://indico.desy.de/event/34520/timetable/#20220927>

# Session conveners

- Cosmology & Astroparticle Physics:
  - Gilly Elor (JGU Mainz),
  - Veronica Guidetti (DESY),
  - Hyungjin Kim (DESY)
- Particle Phenomenology:
  - Matthieu Pellen (U. Freiburg),
  - Bibhushan Shakya (DESY),
  - Emmanuel Stamou (U. Dortmund).
- Strings & Mathematical Physics:
  - Markus Dierigl (LMU Munich),
  - Craig Lawrie (DESY).

# Lunch and dinner

- Lunch on your own in the Kantine, you can pay with cash but be aware that only certain registers (maybe even only one) accepts cash
  - To pay at any register, you can get a DESY card which costs EUR 5 that you get back when you return it. Look for machines in the Kantine ground floor by the left-hand-side stair case
- The conference dinner is tomorrow, Wednesday the 28<sup>th</sup>, after the Hertz lecture
  - It will take place in the Kantine

# Registration / receipts / conf. photo

- Receipts will be available at the secretariat desk
- If you require a receipt with a full institutional address but did not provide one when you registered please ask
- The plan is to have a photo in front of the main auditorium tomorrow (Wednesday) after the first plenary session and before the coffee break



# Please wear a mask!

- There are masks and antigen tests available at the secretariat desk in the foyer
- During the coffee breaks, please consider stepping outside if there is no rain ☺, there are two tents outside as well



**Please enjoy the  
workshop!**