

THEORETICAL AND PHENOMENOLOGICAL ASPECTS OF DARK MATTER



DESY FH FELLOWS MEETING
MARCH 25, 2021



BIBHUSHAN SHAKYA

ABOUT ME



Shakya, Bibhushan

BSM, dark matter,
cosmology, collider pheno

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Junior Staff in TH
since 01/2021

**Research Interest/Expertise:
BSM theory and phenomenology**

Dark Matter

models of dark matter and new ways of testing them

Early Universe cosmology

Baryogenesis scenarios and their low energy tests

Higgs evolution during inflation

Probing BSM phenomena with gravitational wave signals

BSM collider phenomenology

LHC signatures of extended Higgs sectors, dark sectors,
various SUSY scenarios

Neutrino sector extensions

sterile neutrinos and more: dark matter, cosmological
aspects, direct search aspects

A BRIEF HISTORY OF (MY) TIME (AND PHYSICS)



A BRIEF HISTORY OF (MY) TIME



UNDERGRADUATE STANFORD UNIVERSITY (2004-2008)

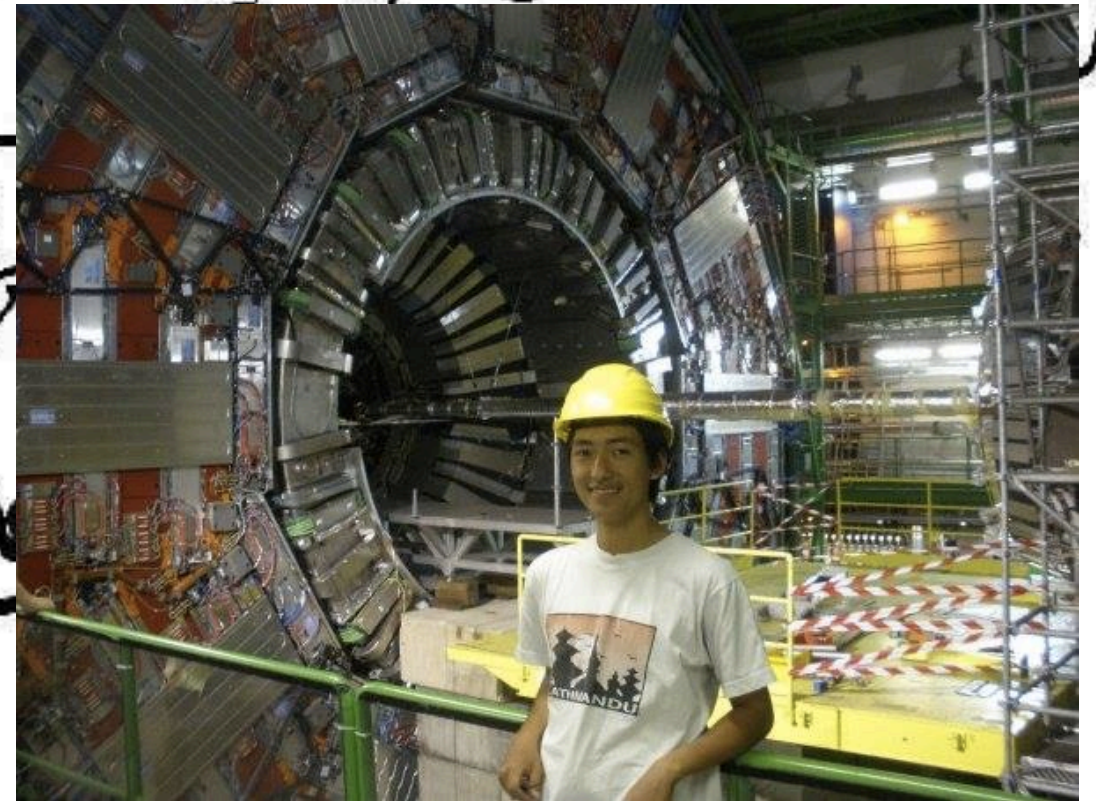


Physics
Mathematics
Philosophy

KATHMANDU
NEPAL



2008 SUMMER CMS @ CERN



pixel calibration for CMS

PHD
CORNELL UNIVERSITY
(2008-2013)



CORN

Dark Matter Hints and Naturalness of Weak Scale Supersymmetry

Bibhushan Shakya

Advisor:

Maxim Perelstein

$$W \supset \lambda S H_u H_d + \frac{1}{3} K S^3$$

$$f \text{---} f$$

$$i h_i$$

$$x \text{---} x$$

Thesis:

Dark Matter Phenomenology in the Golden Era of Experiments

PhD Thesis Defense

(B Exam)

Location: 401 Physical Sciences Building

Time: 10 AM, May 28, 2013

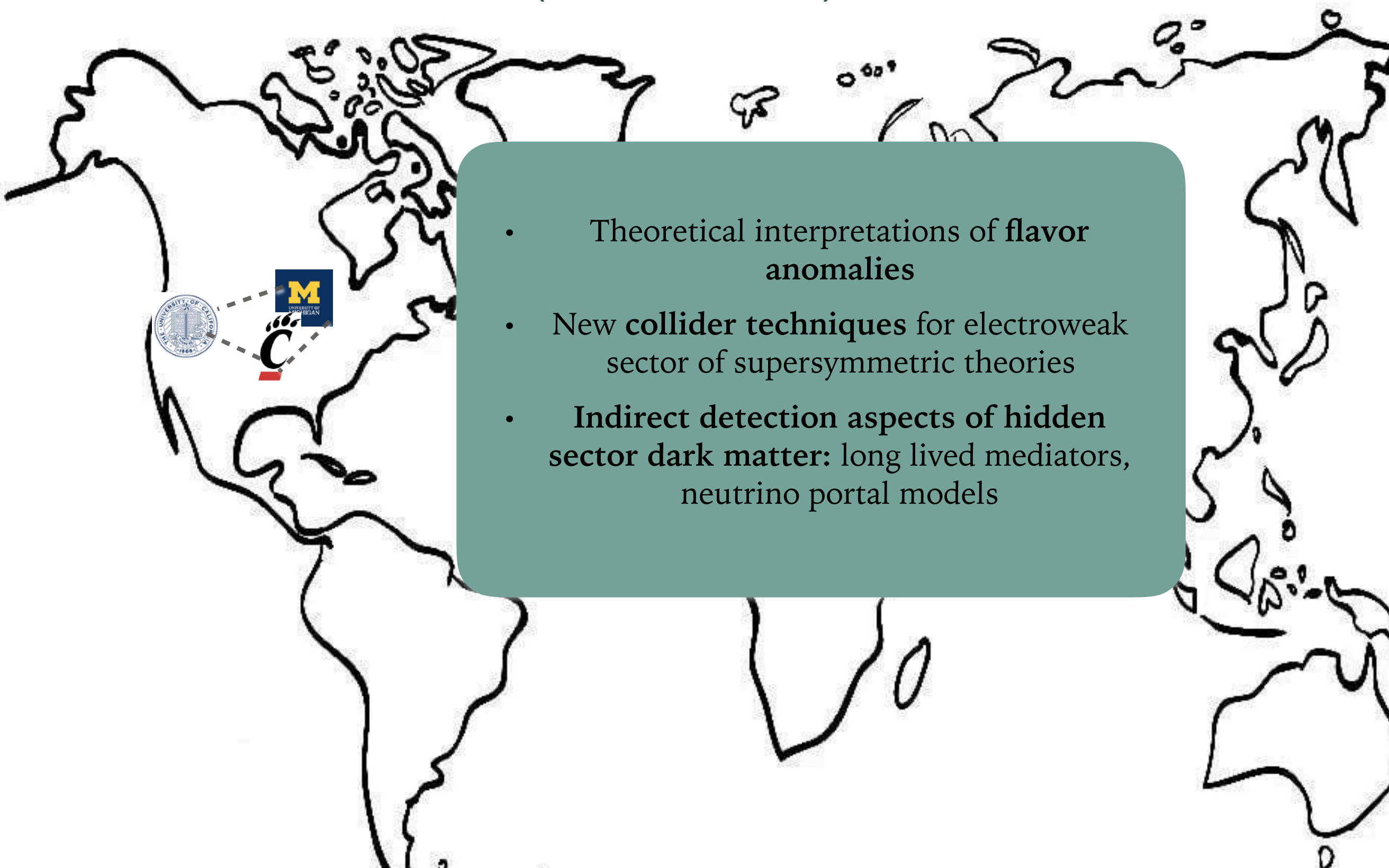
- propagation of dark matter annihilation/decay products in the galaxy
- line-like signals of dark matter from final state radiation
- naturalness of small dark matter direct detection cross sections
- $b \rightarrow s + \gamma$ loop calculation in RS
- deviations in Higgs couplings in SUSY models

POSTDOC UNIVERSITY OF MICHIGAN (2013-2016)

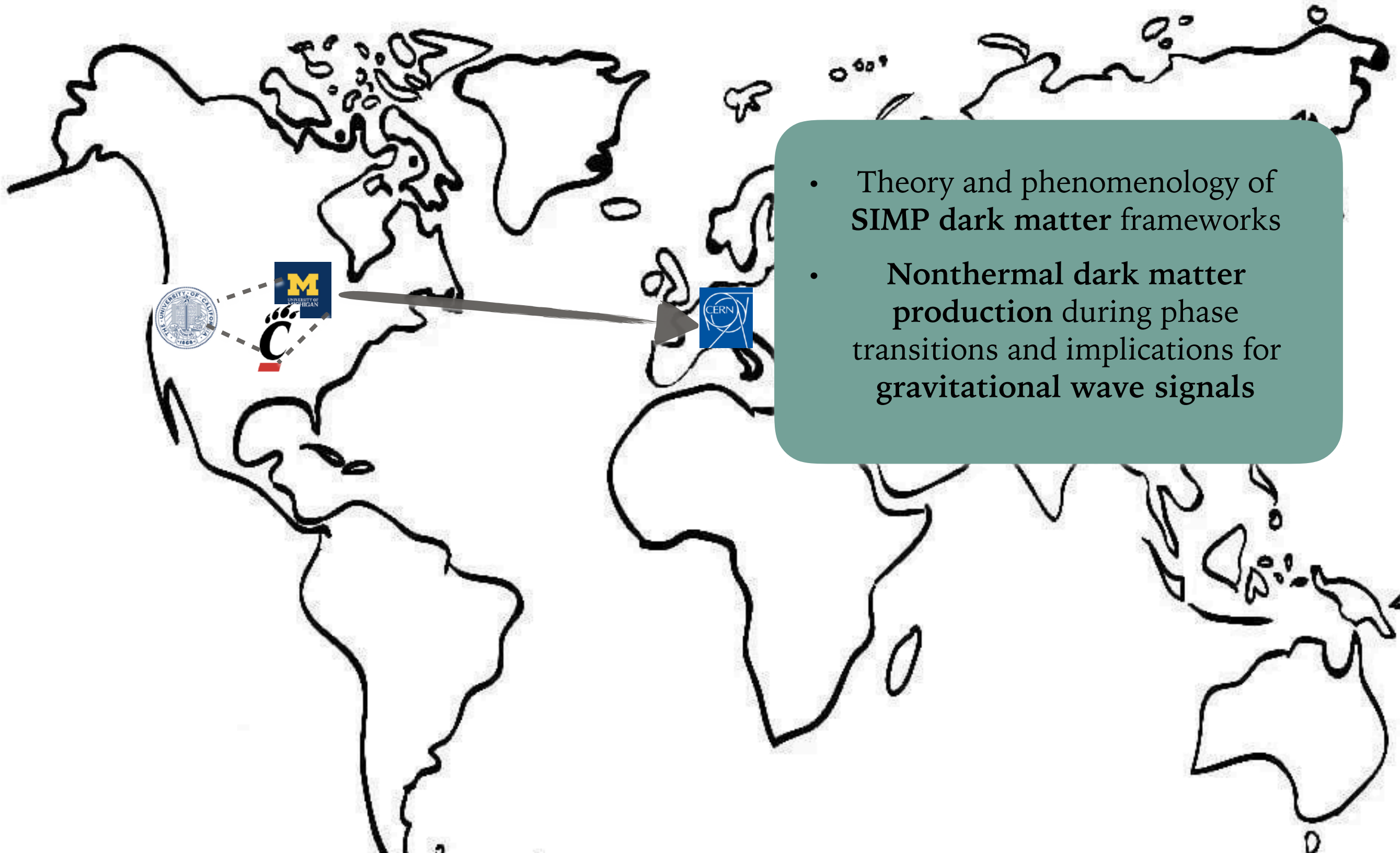
- Evolution of the Higgs field (instability) during inflation
- Cosmological aspects of sterile neutrino dark matter
- **LHC BSM phenomenology:** supersymmetry, heavy Higgs bosons, light hidden sectors
- **Baryogenesis:** from hidden sectors; complementarity with neutron-antineutron oscillation tests



POSTDOC U. CINCINNATI / U. MICHIGAN / UC SANTA CRUZ (2016-2019)

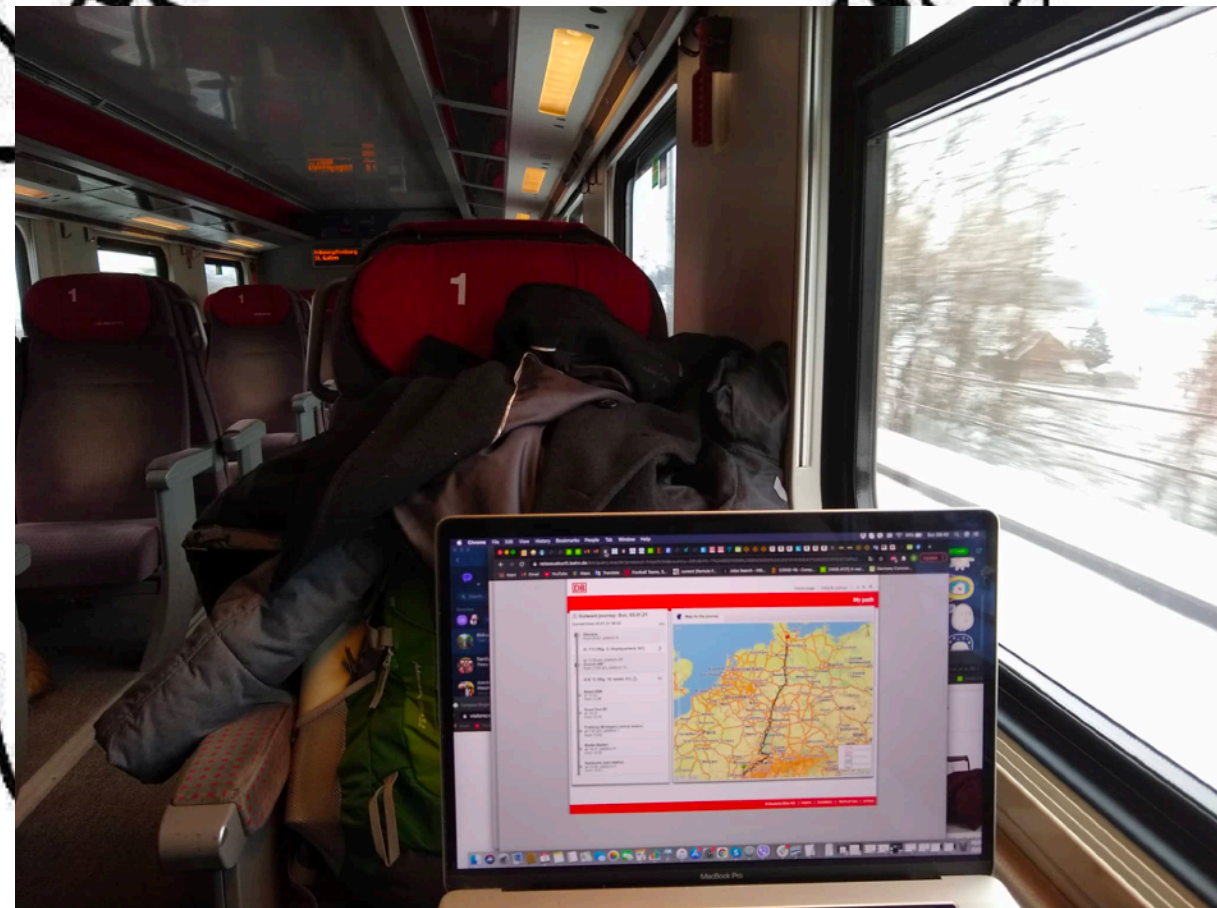
- 
- Theoretical interpretations of flavor anomalies
 - New collider techniques for electroweak sector of supersymmetric theories
 - Indirect detection aspects of hidden sector dark matter: long lived mediators, neutrino portal models

TH FELLOW CERN (2019 - 2020)



- Theory and phenomenology of SIMP dark matter frameworks
- Nonthermal dark matter production during phase transitions and implications for gravitational wave signals

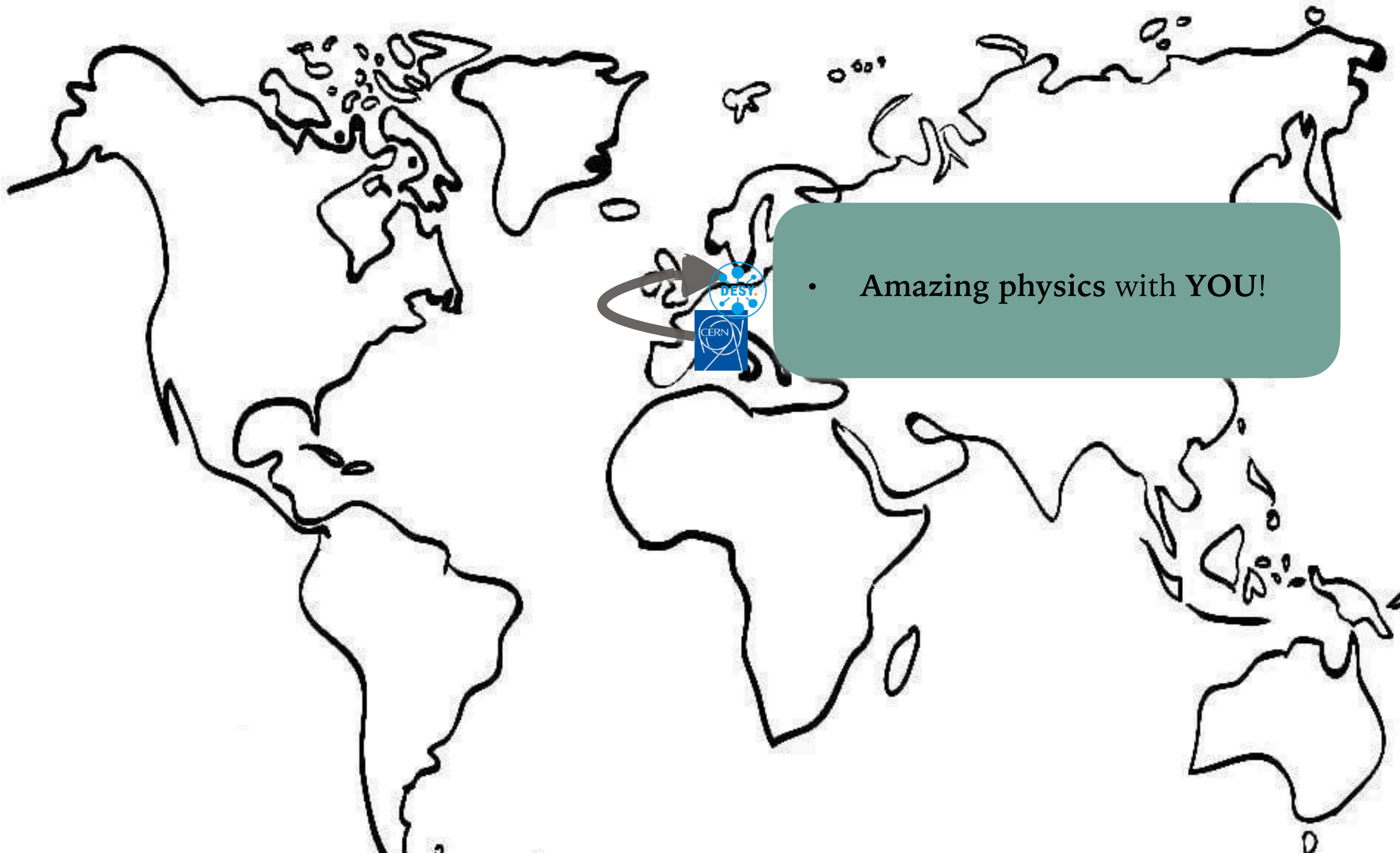
TH JUNIOR STAFF DESY (2021 -)



TH JUNIOR STAFF

DESY

(2021 -)



- Amazing physics with YOU!

CURRENT ENGAGEMENTS

SnowMass2021

Currently serving as Leader/Liaison for
the Cosmic Frontier
Early Career Group

Please let me know if you would like to get involved
in the process (white papers)

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EuCAPT

Organizing Committee of the First
EuCAPT Symposium (May 5-7)

Please submit abstracts for lightning talks
(deadline March 31!)

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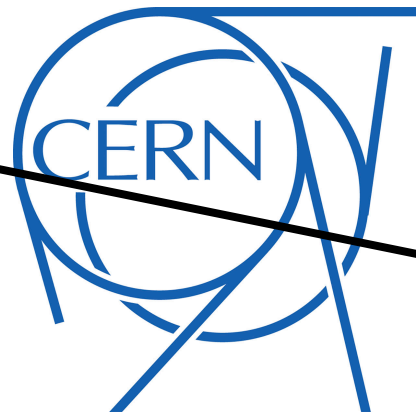
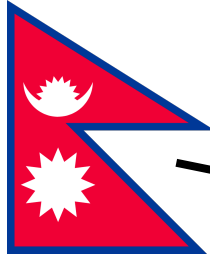
International Neutrino Summer School 2021

(August 2-13, CERN)

Organizing Committee

Official announcements coming soon; students/postdocs, please keep in mind!

Great mountains



...and a plot...



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Looking forward!

Great physics