Theory* Recap**,¹

S(h)eyda Ipek
Carleton University

* BSM particle pheno + astroparticle
** June 2023 - June 2024
¹ for complaints: director@ipp.ca
Theory!

Panic! at the Disco

on the IPP Scientific Council

Evan McDonough
Winnipeg

Aaron Vincent
Queen’s

Yue Zhang
Carleton
New theory faculty

Gopolang Mohlabeng
SFU

was a postdoc at Queen’s

Nikita Blinov
York University

David Morrissey’s PhD student!
IPP 50th Anniversary Connect Postdoctoral Fellowship

Saniya Heeba (theory)

Art by Saniya Heeba

Opening \(\nu\)-Dark Portals: From Lagrangians to Simulations
Dark (matter) times in theory…

The universe is our oyster

Word cloud from Canadian pheno abstracts since June 2023

small scale structure, BBN, CMB, large scale structure, astro simulations, …
Dark Matter Direct Detection on the Moon
Andréea Gaspert,1,* Pietro Giampa,2,† Navin McGinnis,2,‡ and David E. Morrissey2,§
1Department of Physics, Stanford University, Stanford, CA 94305, USA
2TRIUMF, 4004 Wesbrook Mall, Vancouver, BC V6T 2A3, Canada

Gravitational Production of Completely Dark Photons with Nonminimal Couplings to Gravity
Christian Capanelli,a Leah Jenks,b Edward W. Kolb,b,c Evan McDonoughd

Dark Matter Annihilation inside Large Volume Neutrino Detectors
David McKeen,1, a David E. Morrissey,1, b Maxim Pospelov,2,3, c Harikrishnan Ramani,4, d and Anupam Ray,3, e
1Department of Physics, University of British Columbia, Vancouver, BC V6T 1Z1, Canada

Higgs Portal Interpretation of the Belle II $B^+ \to K^{+}\nu\bar{\nu}$ Measurement
David McKeen,1,* John N. Ng,1,† and Douglas Tuckler1,2,‡

Radiative Corrections to Light Thermal Pseudo-Dirac Dark Matter
Gopolang Mohlabeng,1,2, * Adreja Mondol,1,† and Tim M.P. Tait1,‡

Axion-Induced Patchy Screening of the Cosmic Microwave Background
Cristina Mondino,a DaLiPirvu,b Junwu Huang,a and Matthew C. Johnson,a,c

Long-lived particle decays at the proposed MATHUSLA experiment
David Curtin,5 and Jaiprakap Singh Grewal5
Department of Physics, University of Toronto, Toronto, Ontario M5S 1A7, Canada

Cosmic Ray-Boosted Dark Matter at IceCube
Christopher V. Cappiello,1,2,3, * Qinruil Liu,1,2,3, † Gopolang Mohlabeng,4,5, ‡ and Aaron C. Vincent1,2,3, §

Identifying Energy-Dependent Flavor Transitions in High-Energy Astrophysical Neutrino Measurements
Qinruil Liu,1,2,3, * Damiano F. G. Fiorillo,4, † Carlos A. Argüelles,5, ‡ Mauricio Bustamante,4, § Ningqiang Song,6,7, ‡ and Aaron C. Vincent1,2,3, **

Self-interacting dark matter solves the final parsec problem of supermassive black hole mergers
Gonzalo Alonso-Álvarez,1,2, * James M. Cline,2,3, † and Caitlyn Dewar2,‡

Looking in the axion mirror: An all-sky analysis of stimulated decay
Yitian Sun,1 Katelin Schutz,2,3 Harper Sewalls,2,3,4 Calvin Leung,5,6,7,8 and Kiyoshi Wesley Masui6,7

Seyda Ipek
A Dissipative Dark Cosmology: From Early Matter Dominance to Delayed Compact Objects

Joseph Bramante\textsuperscript{1,2,3,*}, Christopher V. Cappiello\textsuperscript{1,2,3,†}, Melissa Diamond\textsuperscript{1,2,3,‡}, J. Leo Kim\textsuperscript{1,2,§}, Qinrui Liu\textsuperscript{1,2,3,¶} and Aaron C. Vincent\textsuperscript{1,2,3,**}

Probing flavor violation and baryogenesis via primordial gravitational waves

Zafri A. Borboruah,\textsuperscript{a} Anish Ghoshal,\textsuperscript{b} Seyda Ipek\textsuperscript{c}

Dissipative Dark Substructure: The Consequences of Atomic Dark Matter on Milky Way Analog Subhalos

Caleb Gemmell,\textsuperscript{1} Sandip Roy,\textsuperscript{2} Xuejian Shen,\textsuperscript{3,4} David Curtin,\textsuperscript{1} Mariangela Lisanti,\textsuperscript{2,5} Norman Murray,\textsuperscript{6} and Philip F. Hopkins\textsuperscript{7}

The impact of the Large Magellanic Cloud on dark matter direct detection signals

Adam Smith-Orlik,\textsuperscript{a} Nima Ronaghi,\textsuperscript{b} Nassim Bozorgnia,\textsuperscript{b,c} Marius Gautun,\textsuperscript{a} Azadeh Fattahi,\textsuperscript{c} Gurtina Besla,\textsuperscript{f} Carlos S. Frenk,\textsuperscript{g} Nicolás Garavito-Camargo,\textsuperscript{g} Facundo A. Gómez,\textsuperscript{h,i} Robert J. J. Grand,\textsuperscript{h,i,j} Federico Marinacci,\textsuperscript{m} and Annika H. G. Peter\textsuperscript{h}

Influence of new states in searches for negative gauge-Higgs couplings

Carlos Henrique de Lima\textsuperscript{1,*} and Daniel Stolarski\textsuperscript{2,†}

Chiral properties of the nucleon interpolating current and \(\theta\)-dependent observables

Yohei Ema,\textsuperscript{1,2,*} Ting Gao,\textsuperscript{2,†} Maxim Pospelov,\textsuperscript{1,2,‡} and Adam Ritz\textsuperscript{3,§}

Can CP be conserved in the two-Higgs-doublet model?

Carlos Henrique de Lima\textsuperscript{1,2,*} and Heather E. Logan\textsuperscript{2,†}

On Dark Matter Self-interaction via Single Neutrino Exchange Potential

Yue Zhang

Seyda Ipek
Dark matter playground

- Axions, ALPs, dark photons...
- Sterile neutrinos, WIMPs...
- Dark atoms, dark stars...
- Primordial black holes...

Seyda Ipek
Theory representation at PPD Symposium at CAP Congress “Dark Matter And Neutrinos”

**Origins of (neutrino-ish) Dark Matter in the Matter Power Spectrum**

Yue Zhang  
Carleton University

CAP Congress 2024, Dark Matter and Neutrinos Symposium  
Western University, London Ontario

**Searching for Light Accelerated Dark Matter**

Gopolang (Gopi) Mohlabeng  
Simon Fraser University  
29 May 2024

**High speed dark matter particles in our Solar vicinity**

Nassim Bozorgnia  
UNIVERSITY OF ALBERTA

2024 CAP Congress “Dark Matter and Neutrinos” Symposium  
Western University  
29 May 2024

**DARK MATTER @ FINITE TEMPERATURE**

Saniya Heeba  
McGILL U.  
CAP CONGRESS 2024
Theory representation at PPD Symposium at CAP Congress “Dark Matter And Neutrinos”

Origins of (neutrino-ish) Dark Matter in the Matter Power Spectrum

High speed dark matter particles in our Solar vicinity

INSTITUTE OF PARTICLE PHYSICS

Search for Dark Matter

Gopolang (Gopi) Mohlabeng
Simon Fraser University
29 May 2024

Quite a few connections to IPP experiments

Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

SFU
Do we know the DM speed distribution?

idealized liquid Xe detector

fast DM particles
due to the Large Magellanic Cloud

Nassim Bozorgnia, et al.

How about Liquid argon detectors?
Do we know the DM speed distribution?

Cosmic Ray-Boosted Dark Matter at IceCube

Christopher V. Cappiello, Qinrui Liu, Gopolang Mohlabeng, and Aaron C. Vincent

SuperK

HyperK?

DUNE?

IceCube

P-ONE?
Dark sector (confining) => scalar, pseudoscalar, vector… => Standard Model

An interesting signal:

I heard that ATLAS search results coming along soon!
Theory (+ experiment) workshops*

GUINEAPIG 2023 - Light dark matter
July 11-13, 2023
Université de Montréal

Dark Matter, First Light
February 2024
Perimeter Institute

Neutrinos in Cosmology
and Astrophysics
March 6-8, 2024
TRIUMF

* there might be ones I wasn’t invited to!
Solar eclipse was a great opportunity for outreach!