

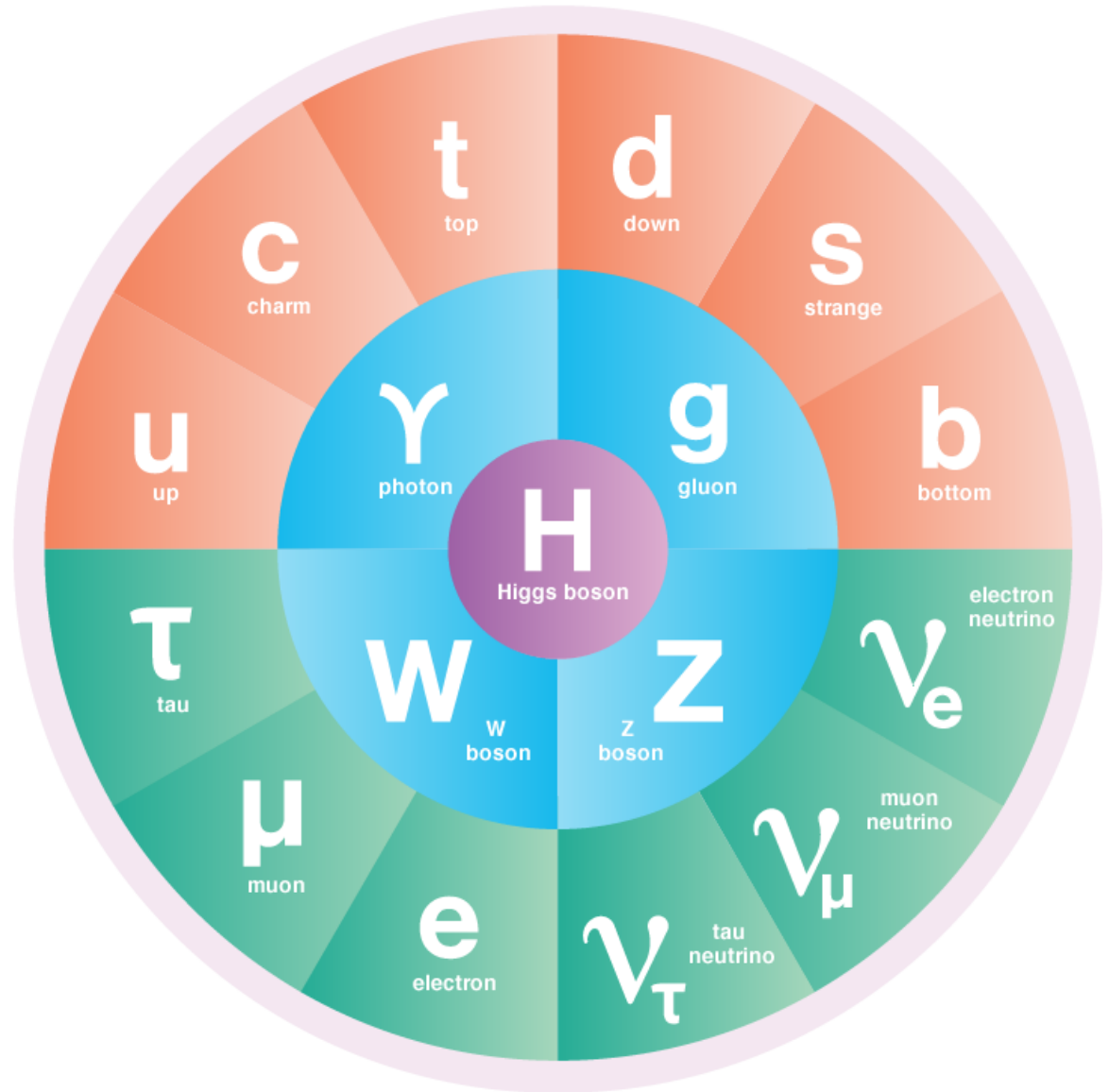
Particle Physics Department

Introduction

Mark Hartz
Oliver Stelzer-Chilton

ACOT Meeting
November 15th, 2019

2019-11-08



Outer Space

Inner Space

Cosmology & Dark Matter

Nuclear Astrophysics

Particle Physics

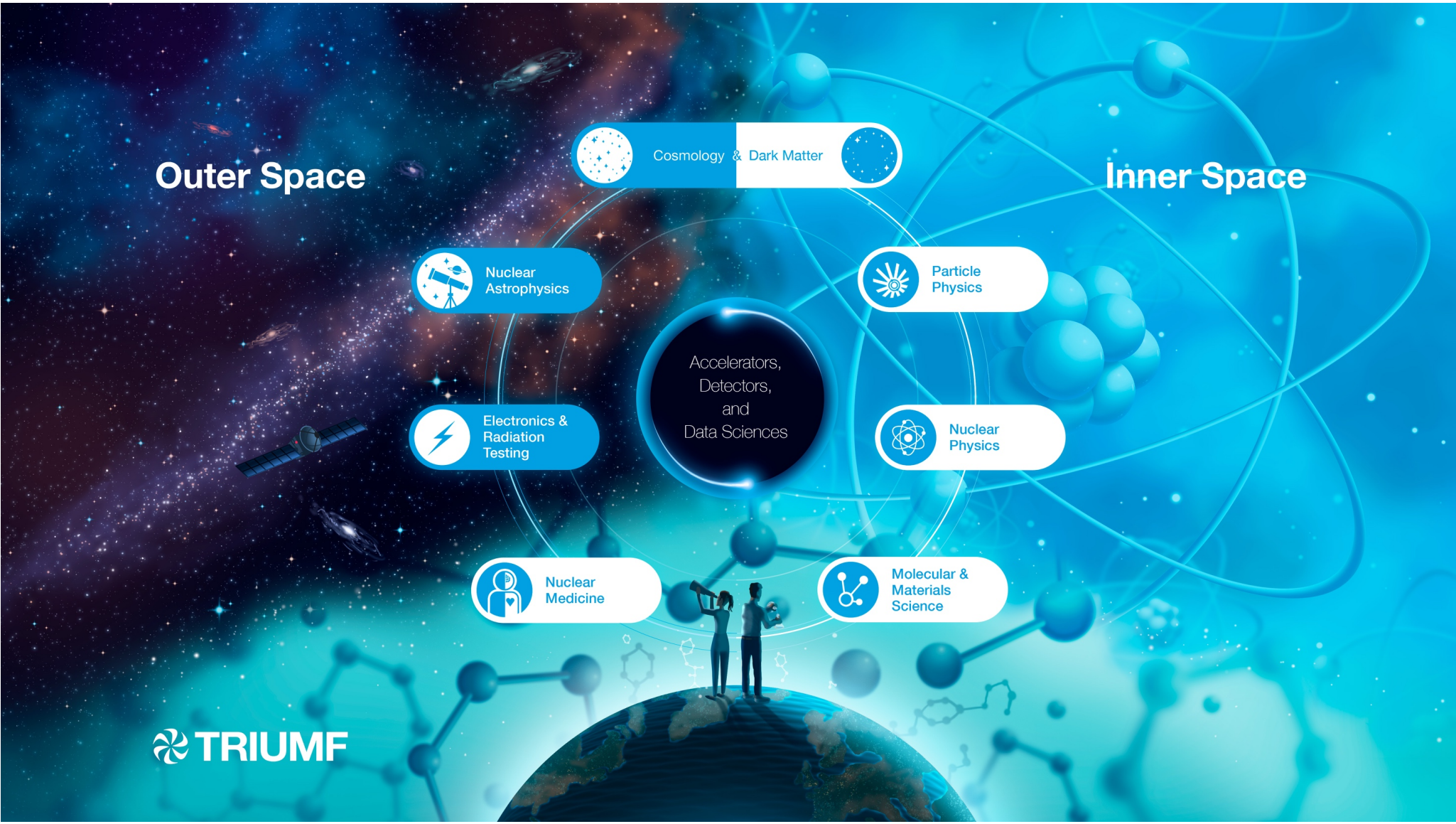
Electronics & Radiation Testing

Nuclear Physics

Accelerators, Detectors, and Data Sciences

Nuclear Medicine

Molecular & Materials Science



Particle Physics within the Physical Sciences Division

The Departments for **Particle Physics**, as well as **Theory** and **Science & Technology** address the following Research topics:

- High Energy Frontier
- Neutrinos and Dark Matter
- Precision Tests of Fundamental Interactions

*Monthly meetings inclusive to Particle Physics Theory and
Science and Technology Department members*

*Dark Matter Forum Meetings
Science and Technology Seminars*

Particle Physics Department

Particle Physics – O. Stelzer-Chilton

Deputy – M. Hartz

I. Trigger	M. Swiatlowski
M. Vetterli (SFU)	O. Stelzer-Chilton
D. Gingrich (UofA)	P. Savard (UofT)
G. Azuelos (UofM, emeritus)	
S. Yen	M. Hartz (with IPMU)
D. Karlen (UVic)	J-M. Poutissou (emeritus)
R. Gornea (Carleton)	A. Konaka
P. de Perio	W. Rau (McDonald Inst.)
M. Fujiwara	
A. Olin (emeritus)	A. Carpa (RA)
R. Picker	R. Mammei A (UofW)
R. Helmer (emeritus)	T. Numao (emeritus)
P. Giampa (OHF)	

ATLAS Tier 1 - R. Tafirout

R. Tafirout
 A. De Silva (P&S)
 D. Deatrich (P&S)
 A. Wong (P&S)
 R. Devbhandri (tech)
 V. Kondratenko (P&S)
 D. Qing (P&S)
 S. Liu (P&S)
 Y. Shin (P&S)

 W. Fedorko (Data Science)
 O. Di Matteo (Data Science)

Affiliated Scientists

R. McPherson (UVic)	B. Stelzer (SFU)
C. Hearty (UBC)	M. Hasinoff (UBC)
S. Oser (UBC)	S. Bhadra (YorkU)

Carry out and support particle physics experiments
 with the TRIUMF community

Focus projects:

ATLAS, T2K/HyperK, UCN, ALPHA, SuperCDMS

ATLAS BAE scientist
 Maximilian Swiatlowski



Data Scientists
 Wojtek Fedorko (Machine Learning)
 Olivia diMatteo (Quantum Computing) – now in
 Theory Department

Particle Physics Mission Statement

- Lead world-class Particle Physics experiments in strong collaboration with Canadian universities.
- Provide, maintain, and exploit the specialized, centralized facilities at TRIUMF required for Canadian scientists to perform state-of-the-art particle physics experiments here, elsewhere in Canada, and abroad. This includes development of beams, detectors, electronics, data acquisition, computing facilities and data analysis.
- Train students and young scientists to become leaders in Canada's future scientific endeavours. Train HQP in electronics, computing and detector technology.

Connecting to the Community

Through organizing workshops (together with theory colleagues) conferences and summer schools

GRIDS, in collaboration with the



TRISEP

Rotating between PI, SNOLAB and TRIUMF

June 10-21, 2019

GRIDS2019
Graduate Instrumentation and Detector School

HOME SPEAKERS REGISTRATION VENUE ACCOMMODATIONS TRAVEL PROGRAM GENERAL COMMITTEE CONTACT

GRIDS2019

GRIDS2019 offers a diversified learning experience, combining lectures from leading experts with hands-on experience with typical detector and instrumentation technology.

Screenshot

THE DARK SIDE OF THE UNIVERSE

BY KATHERINE FREESE

The atoms that make up the known universe constitute only 5% of all matter and energy in the cosmos. What remains is a recipe of 25% dark matter and 70% dark energy, nonluminous components whose nature remains a mystery.

Join Dr. Katherine Freese, author of *The Cosmic Cocktail: Three Parts Dark Matter*, and Professor of Physics at the University of Texas, Austin—as she recounts the hunt for dark matter, from the discoveries of scientists such as Fritz Zwicky and Vera Rubin, who identified the first pieces of evidence for dark matter, to the deluge of data today from satellites, underground laboratories, and the Large Hadron Collider.

Presented by the Tri-Institute Summer School on Elementary Particles (TRISEP)

Dr. Katherine Freese

JULY 22, 2019
Doors open at 6:45PM
Lecture begins at 7:30PM
Q&A to follow

TELUS WORLD OF SCIENCE
1455 Quebec Street
Vancouver, BC

Reserve your free tickets:
<https://darksideoftheuniverse.eventbrite.ca>

TRI-INSTITUTE SUMMER SCHOOL ON ELEMENTARY PARTICLES

PI · SNOLAB · TRIUMF

TRISEP

$$-F_{\mu\nu}F^{\mu\nu} + i\bar{\psi}\not{\partial}\psi + D_{\mu}\phi^{\dagger}D^{\mu}\phi - V(\phi) + \bar{\psi}_L Y \Phi \psi_R + h.c.$$

www.trisep.ca

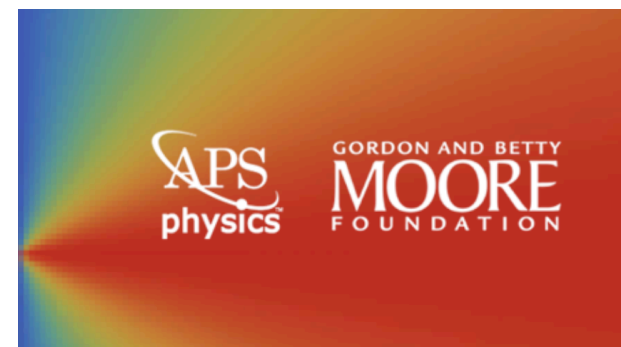
LOCATION: TRIUMF, VANCOUVER, BC
DATE: JULY 22 - AUGUST 2, 2019

<p>TOPICS:</p> <ul style="list-style-type: none"> STANDARD MODEL NEUTRINO PHYSICS BEYOND THE STANDARD MODEL DARK MATTER COLLIDER PHYSICS EXPERIMENTAL METHODS STATISTICS MACHINE LEARNING FOR PARTICLE PHYSICS GRAVITATIONAL WAVES 	<p>SPEAKERS:</p> <ul style="list-style-type: none"> KARSTEN CRASSUS (U ALBERTA) DUNA CROON (TRIUMF) GRACIELA CELMINI (UCLA) BEATE HENNINGMANN (DESY/ANU/FREIBURG) DEAN KARLEN (U VICTORIA) JOACHIM KOPP (CERN/UNI MAINZ) KENDALL MAHN (MICHIGAN STATE U) BEN MACMURRAY (UC BERKELEY) ANTHONY NOBLE (QUEEN'S U/MCDONALD INSTITUTE) RUP TANEDO (UC RIVERSIDE) SEAN TULIN (YORK U) 	<p>LOCAL ORGANIZERS:</p> <ul style="list-style-type: none"> WOJCIECH FEDORKO MARK HARTZ AUDON LISTER DAVID MCKEEN DAVID MORRISSEY PATRICKA DE PERIO OLIVER STELLER-CHILTON ISABEL TRIGGER
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Discovery, accelerated

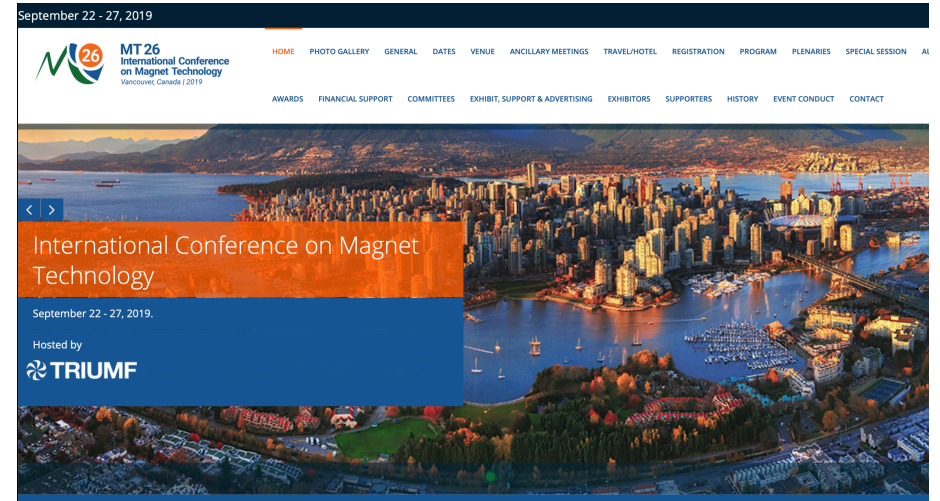
Connecting to the Community

- **New Initiative on Future Directions in Fundamental Physics**
- Planning to have a series of workshops over the next years surveying the landscape of new ways to test fundamental physics at TRIUMF
- A local organizing committee has been setup
- Submitted an application for workshop funding to the Moore Foundation “Convening Awards” together with CENPA/UW
- Awarded US\$50K



Connecting to the Community

- **International Conference on Magnet Technology
September 22-27, 2019**
- Hyatt Regency Hotel, Vancouver
- 773 unique presenters out of the 980 abstracts
- 670 registrations
- 28 international exhibitors



- **ATLAS Collaboration week in Vancouver
June 22-26, 2020**
- Expect 350-400 collaborators
- Venue on UBC campus
- Tours of TRIUMF

TRIUMF 5YP 2020-25

Budget:

TRIUMF 5 YP budget:

- ⚙️ \$292M approved for 2020-2025.
 - ⚙️ this will allow for a strong 'constant effort' operation
-
- With the announcement of the 5YP, the planning for future hires in the division and department has been scrutinized this summer
 - **Comprehensive process in the department to evaluate and agree on our most important priorities**

Particle Physics Hiring Plan

- Immediate hires:
 - ALPHA BAE (*request for hire submitted by PP Dept – 11 months ago*)
 - UCN P&S (*request for hire submitted by PP Dept – 8 months ago*)
 - UCN PD 30% (to be matched by 70% CFI funds)
- Next 5 year plan
 - 2 BAE's for New Initiative at TRIUMF in fundamental physics
- Suggestions for “joint university hires” (but needs university commitment)
 - UCN
 - Dark Matter
 - HyperK
 - Future Collider Experiment
- Written summary distributed to division and director

Data Science and Quantum Computing

- Data Scientist and a Quantum Information Scientist
- Several ML and QC projects (TRIUMF wide) continuing; new projects starting
 - Particle physics
 - μ SR
 - Accelerator control
 - PET
 - QML with D-Wave (MITACS)
 - graph theoretic decomposition
 - Variational quantum eigensolver for



Wojtek Fedorko



Olivia Di Matteo

- Education:
 - Developed and delivered several workshops and schools with ML focus
 - Two QC lecture sequences developed/organized
 - Numerous students (NSERC, Co-op, Capstone, MDS) supervised and on-going and planned
- Collaborations
 - Helmholtz Association and TRIUMF in several working groups
 - ODM is a collaborator in UBC CREATE grant for a training program in QC
 - WF co-leader of Water Cherenkov ML collaboration

Challenges

Space

- Extremely limited office and meeting space for students, postdocs, scientists and visitors
- Currently the problem is further emphasized by de-commissioning of trailers
- Available laboratory space has been an issue for several years

Conclusion: We see the space issue as one of the primary inhibitors of further growth of TRIUMF

A new building is necessary

Hiring plan

- With a federal funding level for the next 5YP that should allow for “strong constant effort” and several retirements in the department, we see an opportunity to complete the critical hires in the department (with no further delay)

Conclusion: It is crucial to implement the department hiring plan with no further delay with highest priority for ALPHA and UCN

Summary

- Excellent track record on designing, enabling and extracting science from particle physics experiments
- We will ensure the continued relevance and success of Canadian and TRIUMF's particle physics by exploiting previous and forthcoming investments in experiments in Canada and abroad
- It is crucial to implement the Particle Physics hiring plan with highest priority for ALPHA and UCN
- We hope the TRIUMF overall hiring plan will be implemented in a transparent way with a focus on critically needed scientific and technical hires
- Limited space remains a major concern



Thank you
Merci

www.triumf.ca

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