



Impact of Science

14-15 June 2018, Ottawa

**Palladian Room, 11.30-12.45**

# **Big Science & infrastructure**

*Laura Hillier (Chair)*

*Mikael Östling*

*Jonathan Bagger*

# Big Science & infrastructure

Laura Hillier

*Director, Performance, Analytics and Evaluation,  
Canada Foundation for Innovation (CFI)*

# How can research infrastructures be used & further developed to best support societal impact of science?

Laura Hillier, Canada Foundation for Innovation  
Dr. Mikael Ostling, KTH University  
Dr. Jonathan Bagger, TRIUMF

AESIS Impact of Science Conference

June 15, 2018

# Canada Foundation for Innovation

- Created by the Government of Canada in 1997, to build Canada's capacity to undertake world-class research and technology development that benefits Canadians by investing in the **research infrastructure** necessary for our researchers to discover, develop and apply new knowledge in all areas of science, humanities, health, engineering and the environment.

# CFI funding – ranges

Awarded amount ranges	# Awards	% Awards	CFI Amount	% CFI Amount
≤ 1 Million	9,271	91.5%	1,687,334,121	26.5%
1 – 10 million	785	7.7%	2,671,672,685	42.0%
> 10 million	80	0.8%	2,004,780,931	31.5%

Awarded by Fund	# Awards	% Awards	CFI Amount	% CFI Amount
Innovation Fund	1,194	11.8%	3,362,966,659	52.8%
John R. Evans Leaders Fund	8,735	86.2%	1,435,665,159	22.6%
Major Science Initiatives Fund	31	0.3%	539,154,371	8.5%
Other	176	1.7%	1,026,001,548	16.1%

<b>TOTAL</b>	<b>10,136</b>	<b>100%</b>	<b>\$6,363,787,737</b>	<b>100%</b>
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# MSI standard performance indicators

Indicator category	Data requested (annually)
✓ <b>Advancement of research / knowledge transfer</b>	Key knowledge transfer activities, including the dissemination of research knowledge linked to the use of the facility (i.e. number of scientific contributions including peer-reviewed publications, conference proceedings, presentations, posters, books/chapters, other, etc.)
✓ <b>Contribution to the training of highly qualified personnel (HQP)</b>	Number of HQP (i.e. undergraduate and graduate students, postdoctoral fellows, technical and professional personnel) trained at the facility or who used data from the facility
✓ <b>Technology transfer</b>	Key technology transfer activities linked to the use of the facility (i.e. technical reports, licenses, patents, spin-offs, other etc.)
✓ <b>Access to the facility</b>	Number of users of the facility (e.g., on site, remote and data users) and their distribution (e.g., geographic and sector)
✓ <b>Optimal use</b>	The level of use of the facility as a function of total capacity excluding required maintenance periods (e.g. percentage of time being used vs. availability, percentage of use requests fulfilled etc.)
✓ <b>Level of user satisfaction</b>	Of those using the facility in the past year, how many were very satisfied, satisfied, neutral, dissatisfied or very dissatisfied? (e.g., average level of satisfaction)

# Arctic research

A collaborative project to assess **scientific and societal impacts** of a research platform



## **An Expert Panel found that the Amundsen platform and research program:**

- is enabling science of the highest international quality and is facilitating the translation and application of new knowledge to address societal issues of major consequence for the Arctic regions of Canada and for other Arctic settings
- has had a major impact on the productivity, reach and influence of Canadian Arctic science as shown by the strong publication record and by the seminal papers produced on such topics as sea ice and ecological research in the Beaufort Sea
- has engaged a diverse set of end-users encompassing federal and provincial science-based government departments and agencies, industry, and communities

# Big Science & infrastructure

Mikael Östling

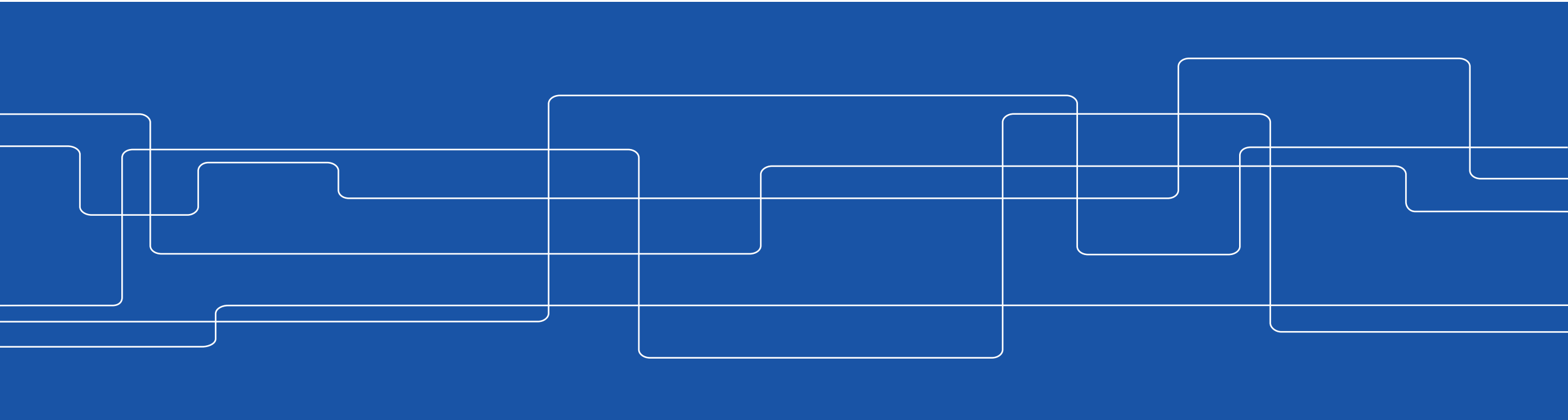
*Deputy President, KTH Royal Institute  
of Technology, Sweden*





# Research infrastructures and societal Impact-The University perspective

Mikael Östling, 2018-06-15  
Deputy President





# A leading technical university in Europe







# KTH

- **Sweden's oldest and largest technical university**
- **16,000 students**
- **2,000 PhD students**
- **5,400 employees**
- **Five campuses in the Stockholm region, research infrastructures in all of them**
- **Ranked among the top 10 Universities of Science and Technology in Europe and among the top 100 best universities in the world by QS**



# Challenges

- Research Infrastructures essential for research
- Increased need for strategic approach to research infrastructures in order to conduct excellent research
- Decrease of national funding for research infrastructures
- KTH has to take full responsibility to make sure labs, instruments, etc. exist and that the money is used in an efficient way to make sure excellent research can be performed + educational needs is fulfilled.



# KTH Research Infrastructures

- Give incentives to cluster instruments and smaller lab environments to larger RI.
- Give incentives to use of digitalized systems for internal bookings and billing.
  - Increased use of existing labs and instruments
  - Create possibilities for increased external use of labs and instruments
    - ✓ Impact
    - ✓ Generate income
    - ✓ Future partnerships – both regarding RI and in research projects



# KTH Research Infrastructures

- **STRATEGIC, USED BY MANY AND INCLUSIVE**
- **HAVE LONG TERM PLANNING RELATING TO ORGANISATION, FUNDING, SCIENTIFIC GOALS & WIDER IMPACT**
- **CONTINUOUS QUALITY DEVELOPMENT**
- **9 criterias**

# Science for Life Laboratory

**Develop and use  
large-scale technologies for molecular biosciences  
with a focus on health and environment**



- Joint Uppsala – Stockholm center with two nodes
- Hosted by four universities
- Official start, July 1, 2013
- Approximately 1000 researchers
- Infrastructure for molecular bioscience

Enabler for Life Sciences





**Swedish National Infrastructure for Computing**





# Large scale infrastructures



**CERN, SWITZERLAND**



**MAX IV LABORATORY,  
SWEDEN**



**THE EUROPEAN SPALLATION  
SOURCE (ESS), SWEDEN**



**PETRA III, GERMANY**

# MAX IV

- A next-generation synchrotron radiation facility in southern Sweden
- Strongest of its kind in the world
- Two storage rings, the larger has a circumference of 528 meters and operates at 3 GeV energy.
- The coming smaller ring will have a circumference of 96 and operate at 1.5 GeV energy.



# Combination of different levels

National Infrastructure



Big Science



Local research  
infrastructure

# Societal Impact from Research Infrastructures

1. General Accountability for research
2. Increase public interest for Science, Research and Technological development
3. Source for Innovation and accelerating commercialization from science
4. Tech and business development for subcontractors
5. Science villages in cities



# KTH Strategic partnerships

Establishment of long-term collaboration for mutual development

- Yearly management dialogue on future challenges
- High level meetings all partners



## Instruments for collaboration

- EU/ National/ Regional initiatives
- Centra
- Mobility
- Joint Research projects
- Education- thesis, challenges in education, guest lectures
- Life long learning
- Research infrastructure

# Big Science & infrastructure

Jonathan Bagger

*Director, Canada's Particle  
Accelerator Centre TRIUMF*

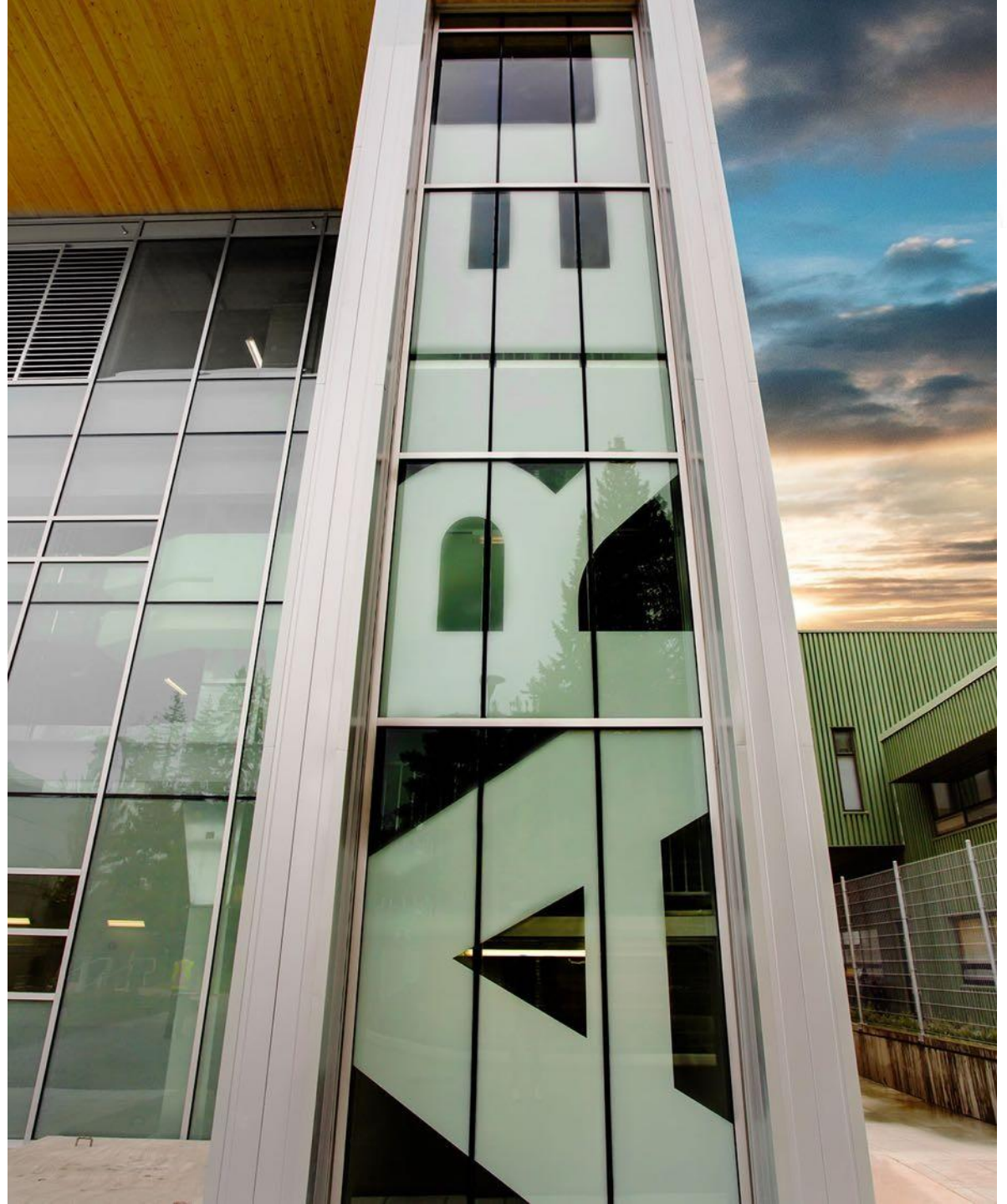




# TRIUMF – Impact Across Three Dimensions

AESIS  
June 15, 2018

Jonathan Bagger  
Director



Discovery,  
accelerated



**TRIUMF**

**50** anniversary  
anniversaire







A woman with long brown hair, wearing a dark grey cardigan over a black top and a patterned skirt, is kneeling on a yellow surface in a laboratory. She is focused on adjusting a small, cylindrical metal component with a screwdriver. The component is part of a larger assembly that includes several pink, ring-shaped magnets. In the background, other people are visible, including a man in a dark blue lab coat and another person in a grey shirt and jeans. The setting is a busy laboratory with various equipment and materials.

TRIUMF is Canada's  
particle accelerator centre

# **What is TRIUMF?      A World-Class Laboratory**

**TRIUMF is a place where teams of researchers collaborate on projects that are too large and too complex for any single institution**

- **TRIUMF is home to a billion-dollar multidisciplinary research infrastructure**
- **TRIUMF enables the Canadian S&T community to carry out internationally recognized cutting-edge research**





 **TRIUMF**

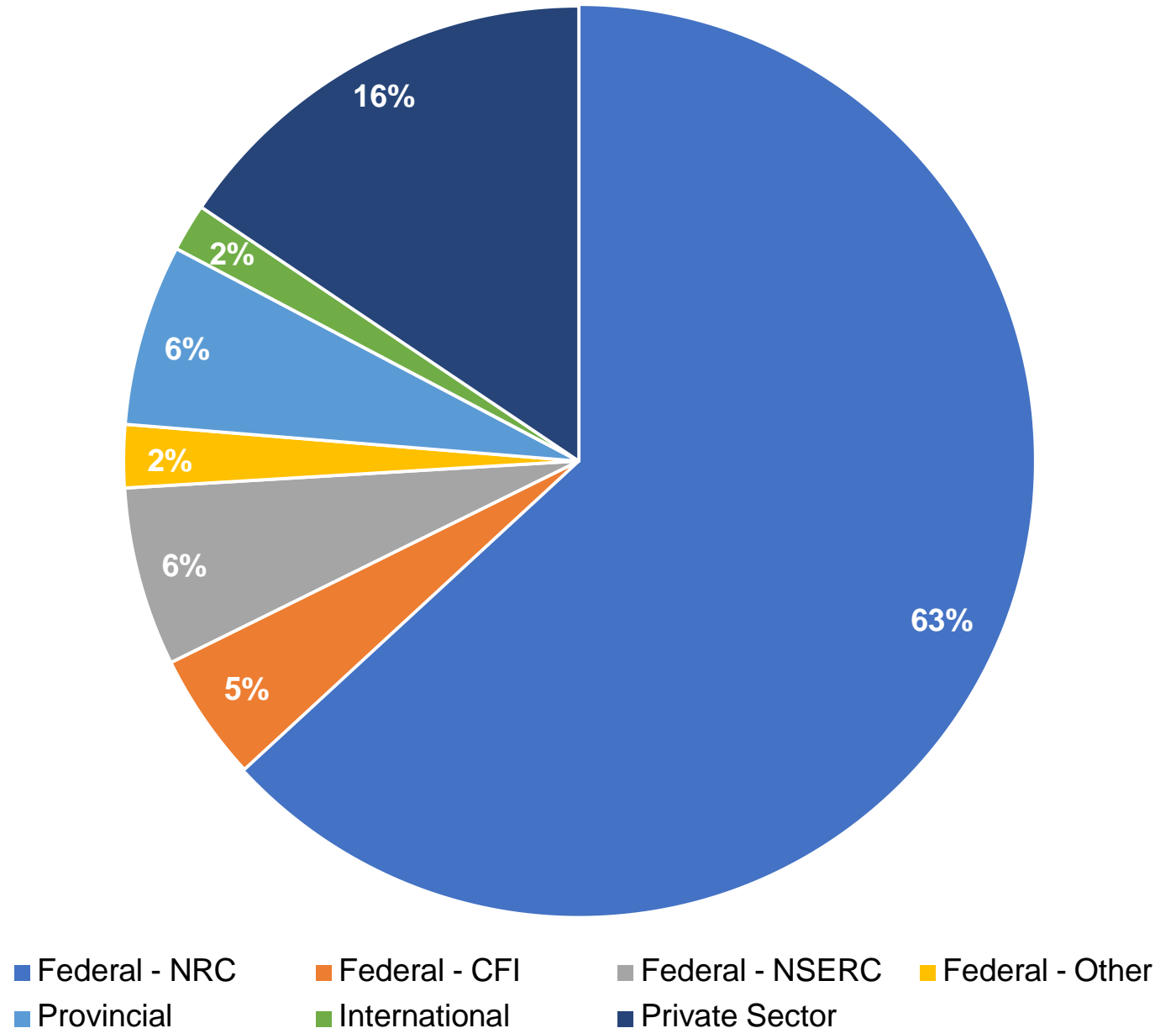
# Large-Scale

FY17/18:

\$95.2M Total Funding

535 Employees (407 NRC)

Revenue Sources (2015-2020)

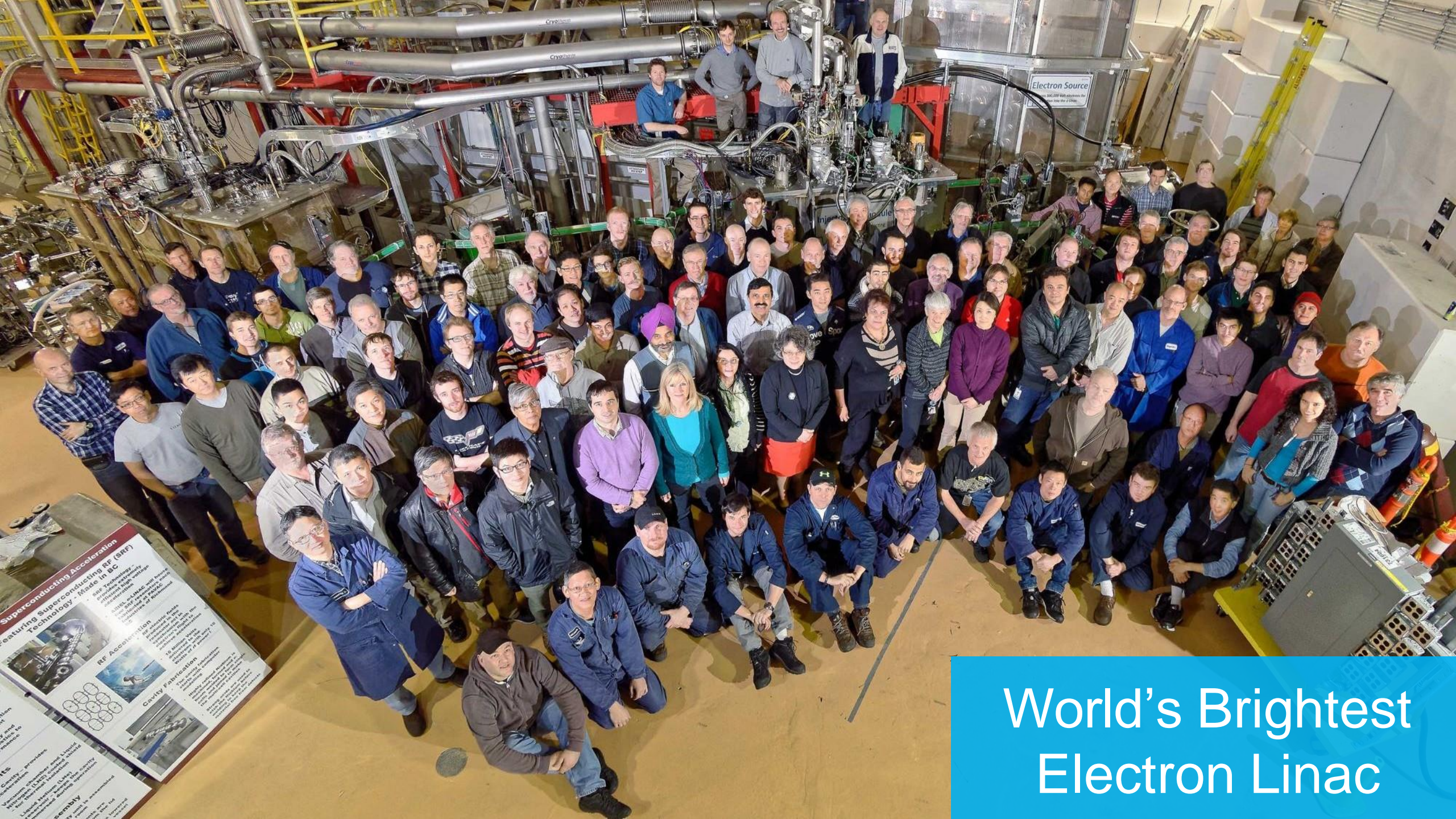






World's Largest  
Cyclotron





World's Brightest  
Electron Linac



Dark Matter  
& Cosmology

Electronics  
Radiation Testing

Molecular &  
Materials Science

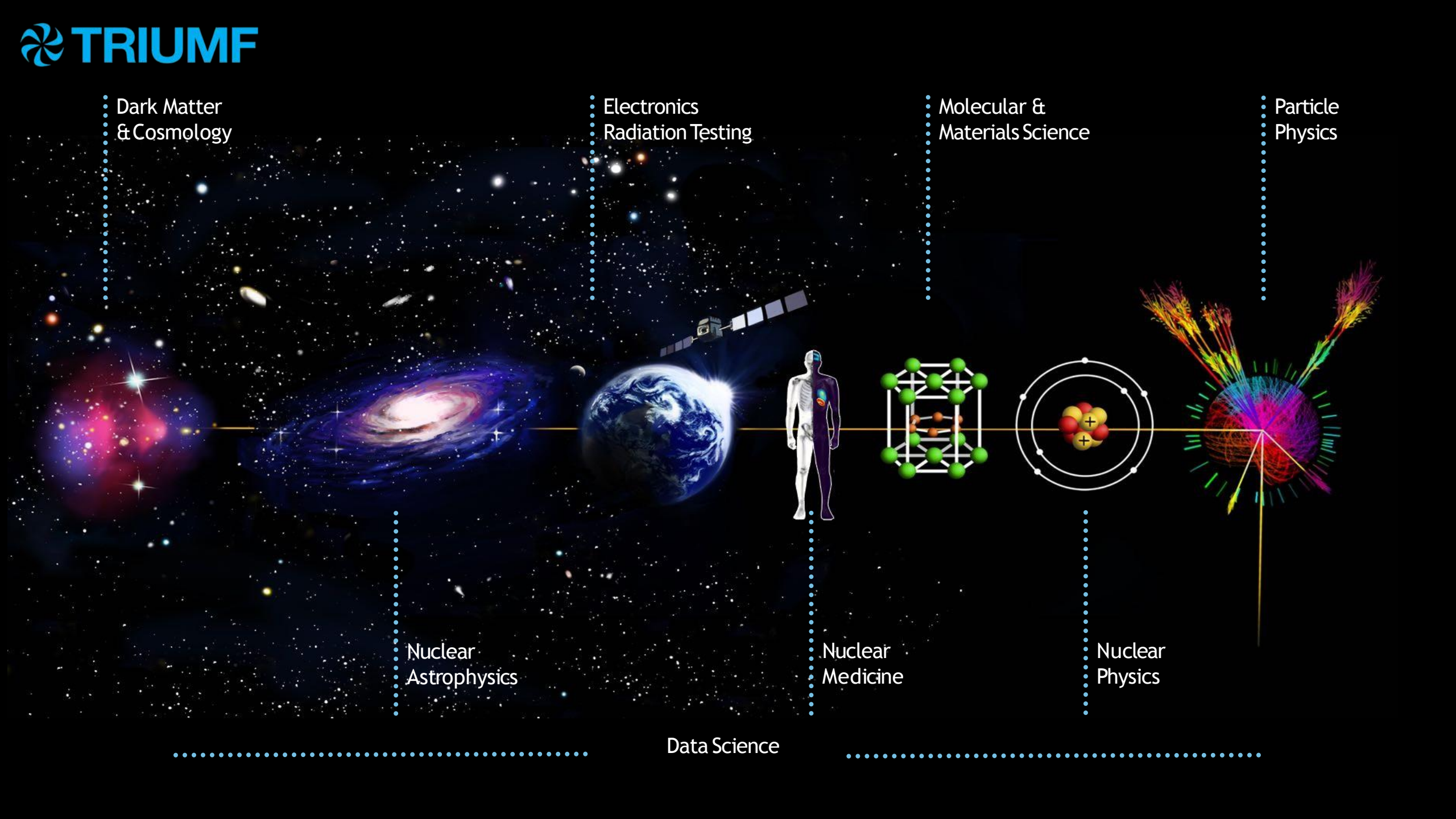
Particle  
Physics

Nuclear  
Astrophysics

Nuclear  
Medicine

Nuclear  
Physics

Data Science



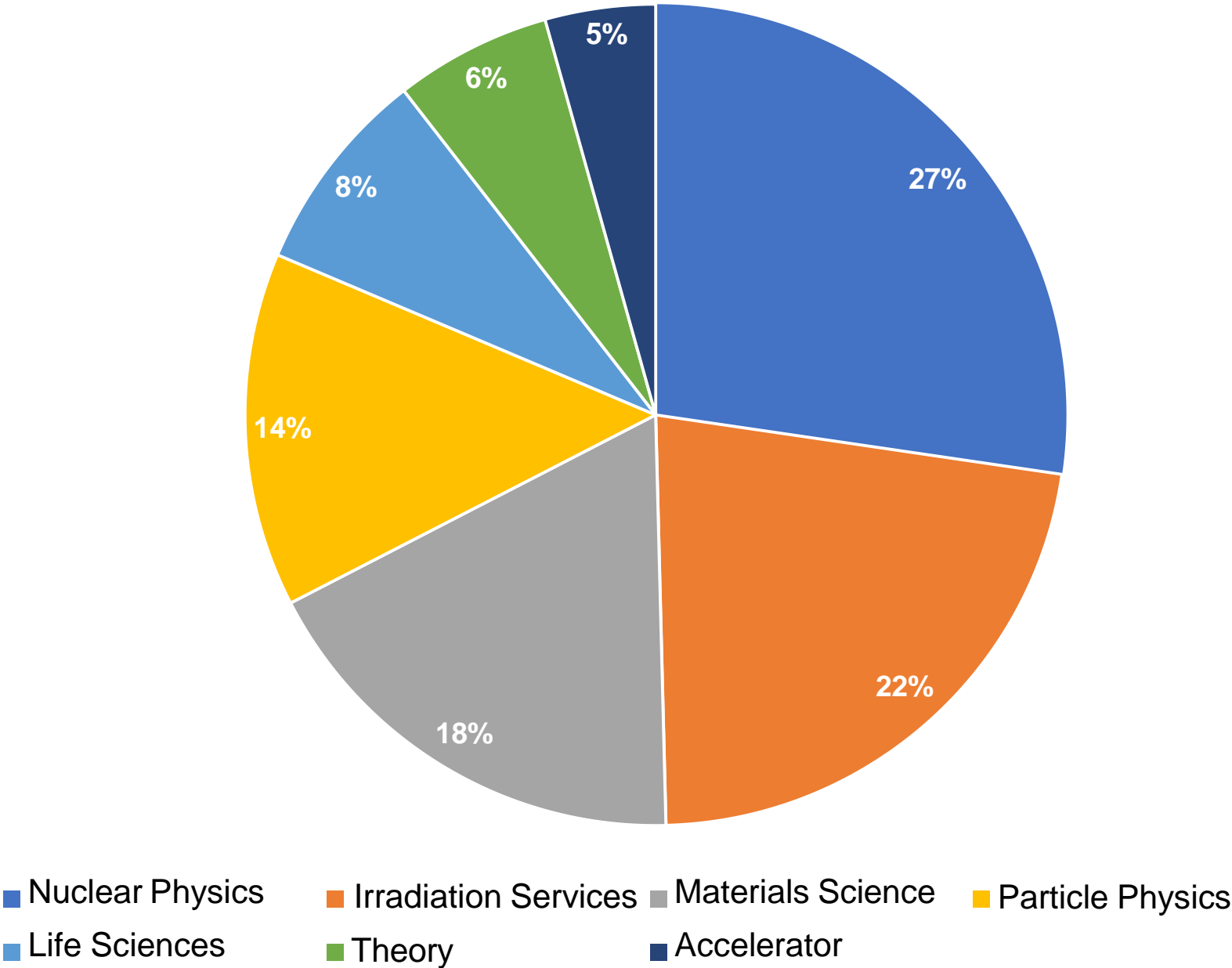


# Multidisciplinary

FY17/18:

875 Scientific Users and Visitors

Scientific Users and Visitors by Field (FY17/18)



# What is TRIUMF?      A Network Hub

**TRIUMF links leading universities across Canada with each other and with national and international facilities around the world**

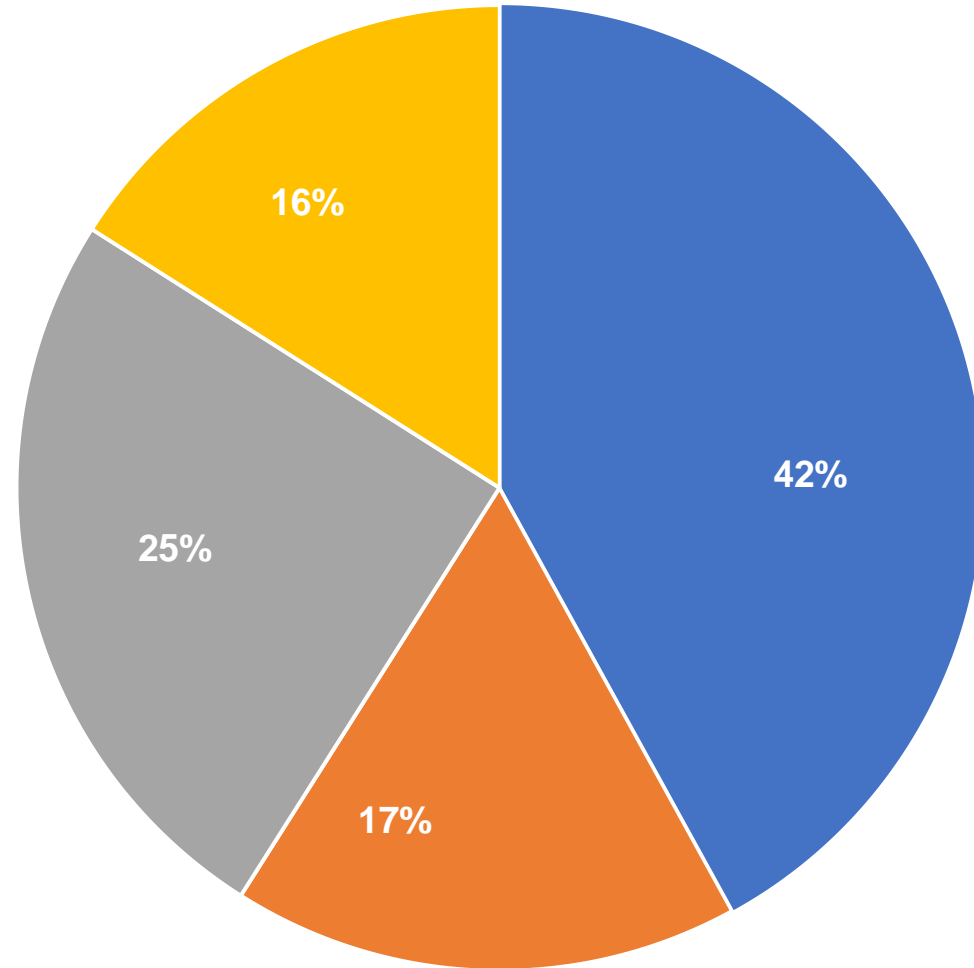
- **TRIUMF is a magnet for people and ideas – for attracting, training, and retaining talent for Canada**
- **TRIUMF allows Canadians to compete at scale in the global scientific enterprise**

## 20 Member Universities

University of Alberta  
University of British Columbia  
University of Calgary  
Carleton University  
University of Guelph  
University of Manitoba  
McGill University  
McMaster University  
Université de Montréal  
University of Northern  
British Columbia  
Queen's University  
University of Regina  
Saint Mary's University  
Université de Sherbrooke  
Simon Fraser University  
University of Toronto  
University of Victoria  
Western University  
University of Winnipeg  
York University



Scientific Users and Visitors by Region (FY17/18)

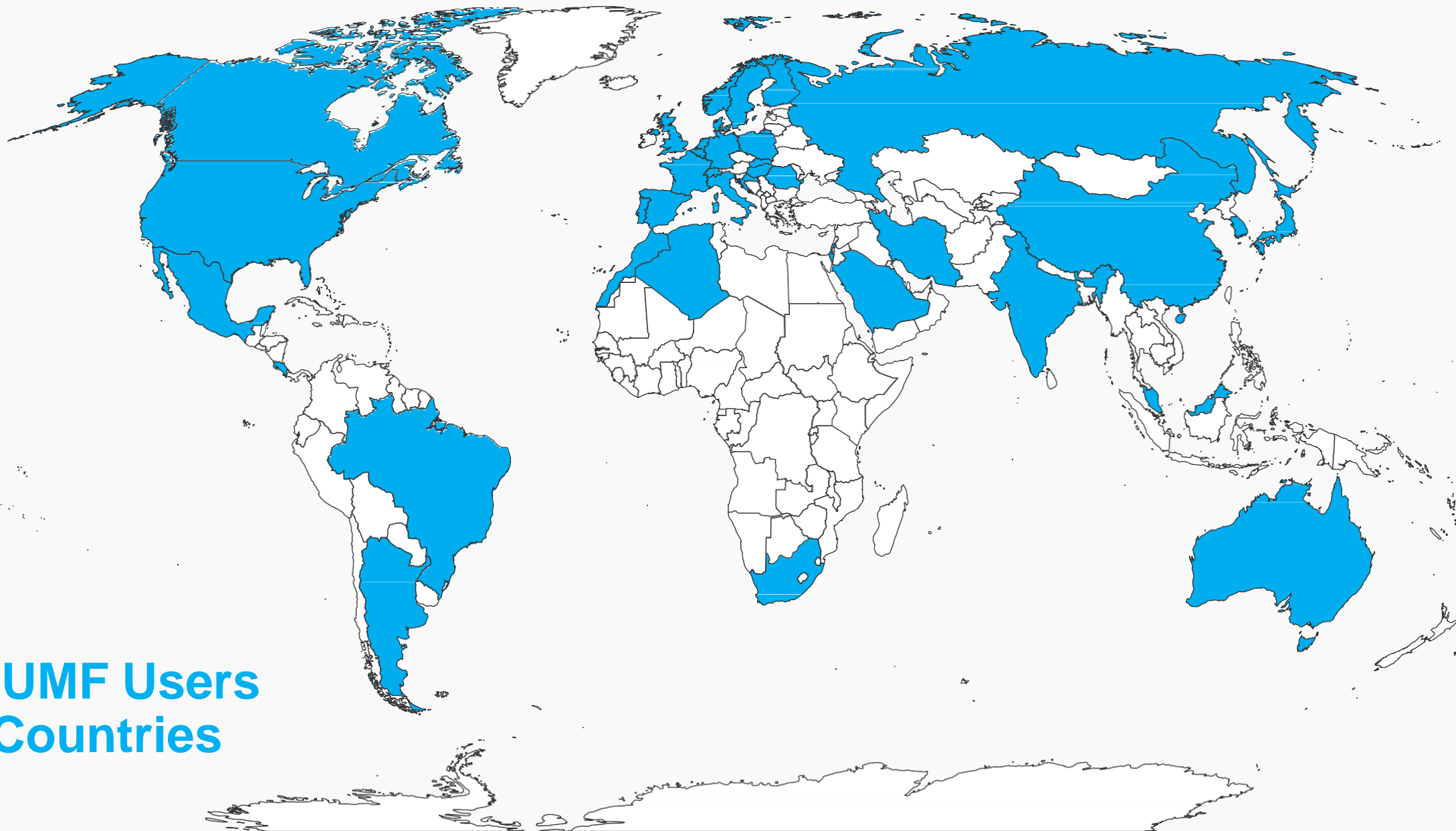


■ Canada ■ Asia ■ Americas ■ Europe

# Global Destination

FY17/18:

875 Scientific Users and Visitors



## TRIUMF Users 39 Countries

# **What is TRIUMF?      A Global Brand**

**TRIUMF is unique in Canada, and known world-wide as a Canadian centre of excellence**

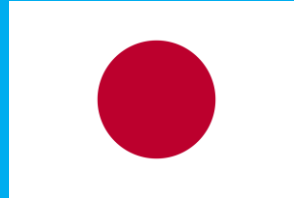
- **TRIUMF serves as a scientific ambassador, advancing Canada's interests at home and around the world**
- **TRIUMF is a model for engagement with the commercial sector**

# 50+

international  
agreements



CERN  
*Europe*



KEK / J-PARC  
*Japan*



VECC  
*India*



Helmholtz Association  
Centres  
*Germany*



Department of Energy  
Laboratories  
*USA*



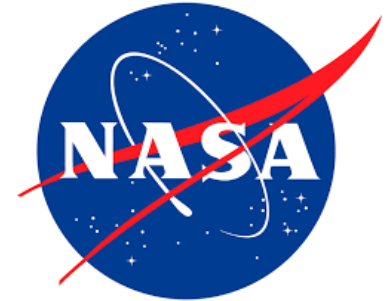
Italian President Sergio Mattarella

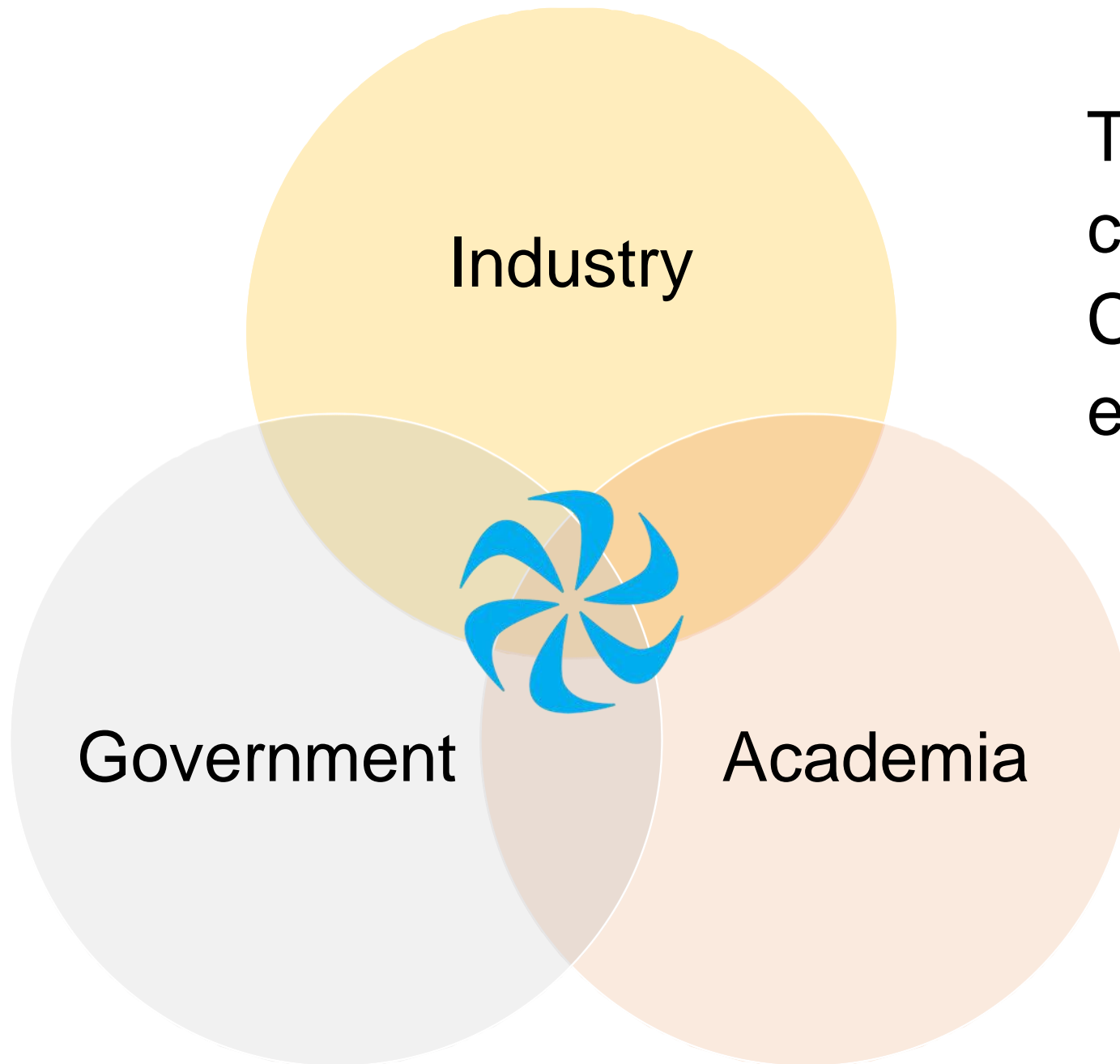


July 10, 2017



# Commercial Partners





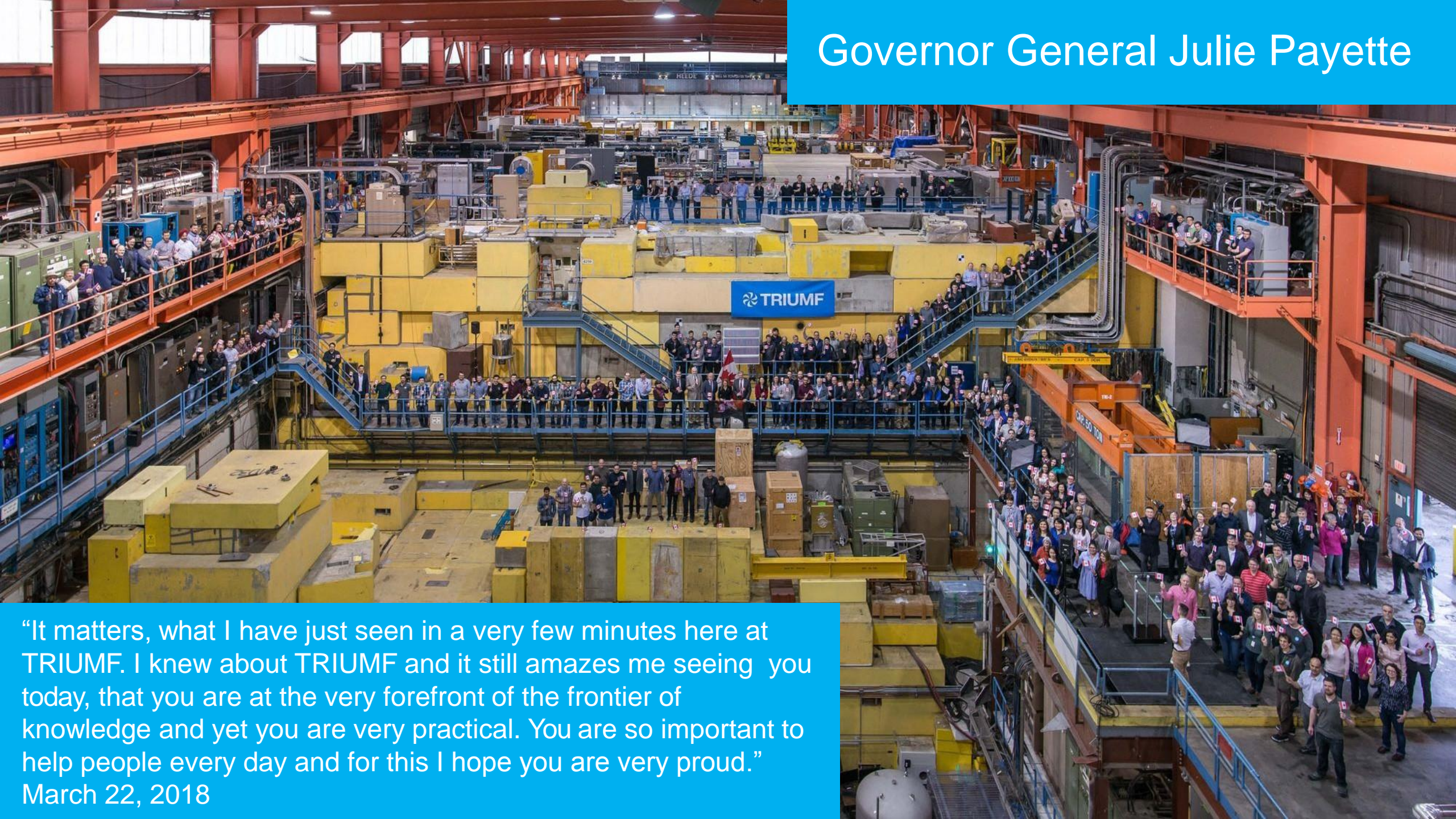
TRIUMF plays a  
critical role in the  
Canadian innovation  
ecosystem

# TRIUMF delivers value to Canada across three critical dimensions

- Science and Technology
- People and Skills
- Innovation and Collaboration



# Governor General Julie Payette



“It matters, what I have just seen in a very few minutes here at TRIUMF. I knew about TRIUMF and it still amazes me seeing you today, that you are at the very forefront of the frontier of knowledge and yet you are very practical. You are so important to help people every day and for this I hope you are very proud.”  
March 22, 2018



Thank you  
Merci

[www.triumf.ca](http://www.triumf.ca)

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