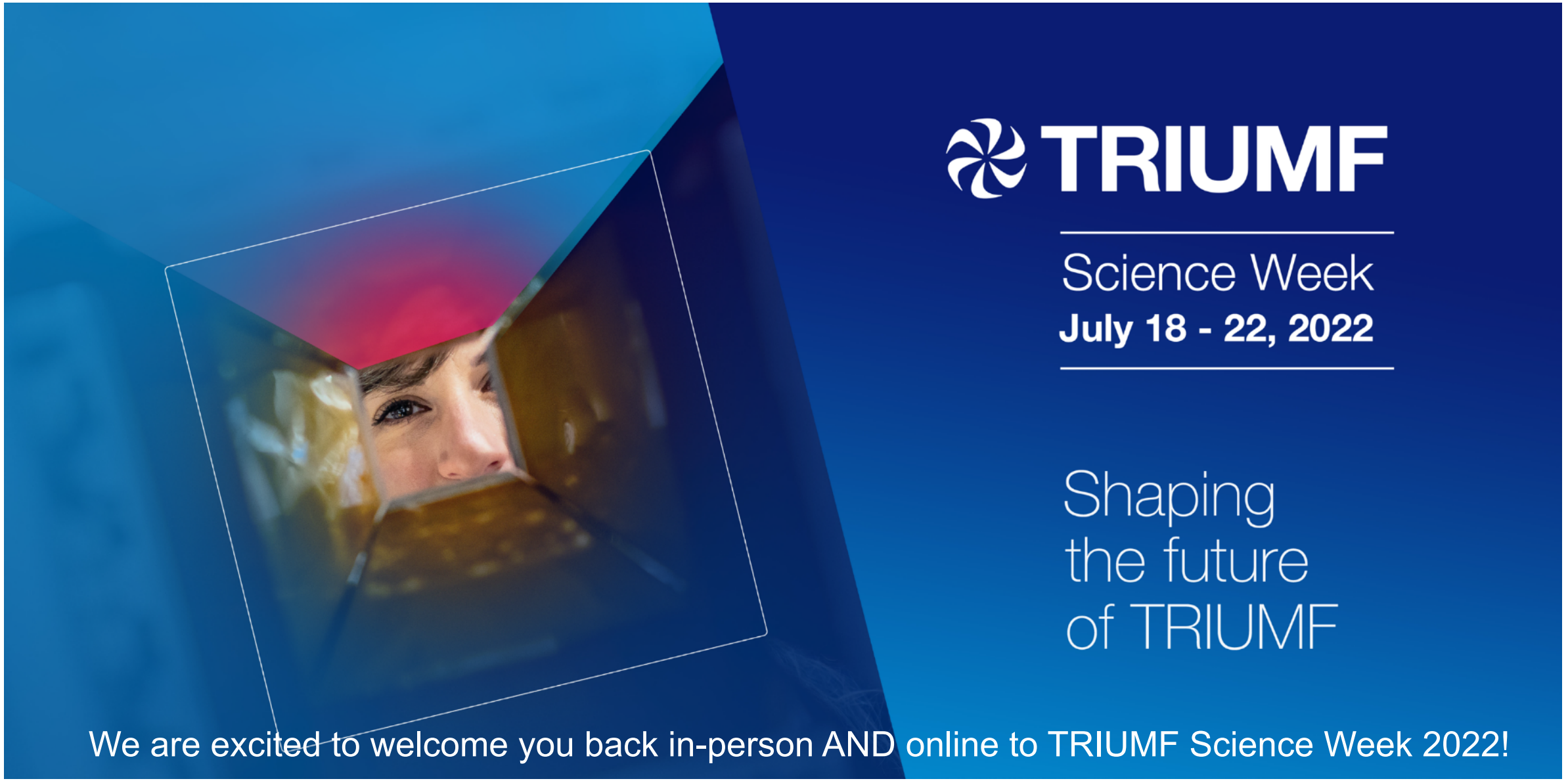


We are excited to welcome you back in-person AND online to TRIUMF Science Week 2022!

Overview

- Science Week 2022 will feature 3 main program streams
- **Celebrate** - recent achievements from the past year and articulate the science drivers for our current program through invited local speakers and from our networks
- **Collaborate** - on major science directions and new initiatives for the next 5-Year Plan -guided by TRIUMF's 20-Year Vision
- **Connect -** through ample networking opportunities for community, students and postdocs –engagements

- Science Week will mark the start of the 5-Year Plan preparation process with input from the community, divisional planning and stakeholders from across our networks

Program (Monday & Tuesday)

- Celebrate recent achievements targeting early career scientists at all levels
  - Accelerator Science
  - Nuclear and Particle Physics
  - Science & Technology
  - Scientific Computing
  - Molecular & Material Science
  - Life Sciences
- Keynote speakers connected to the 5-Year Plan goals and planning

See list of invited speakers

Program (Wednesday - Friday)

- Dedicated to the **5-Year Plan** development framed by the **20-Year Vision**
- Community input
  - Example “life-bridge” to International Conference for Atomic Physics (ICAP) in Toronto
  - Session on New Initiative around new AMO/Precision/Quantum centre at TRIUMF
- Divisional planning status for 2025-2030, new projects, needs for existing program
- Two panel discussions
  - **Basic Science for Sustainability**
    - As part of the International Year of Basic Sciences and Sustainability Development (IYBSSD 2022) - TRIUMF recently became a Founding Partner
    - Opening ceremony at UNESCO in Paris on July 8th
  - **EDI at TRIUMF – Past/Present/Future**
- Townhall with director/CEO + divisional directors and TRIUMF User Group AGM

Science for Society Panel Discussion

In partnership with unesco IYBSSD2022

Prof. Dr. Hamid Ait Abderrahim
(Deputy Director General, SCK-CEN)

Dr. Prajval Shastri
(Vice Chair, IYBSSD2022)

Dr. Nigel Smith
(Director and CEO, TRIUMF)

Luca Egoriti
(PhD student, TRIUMF/UBC)

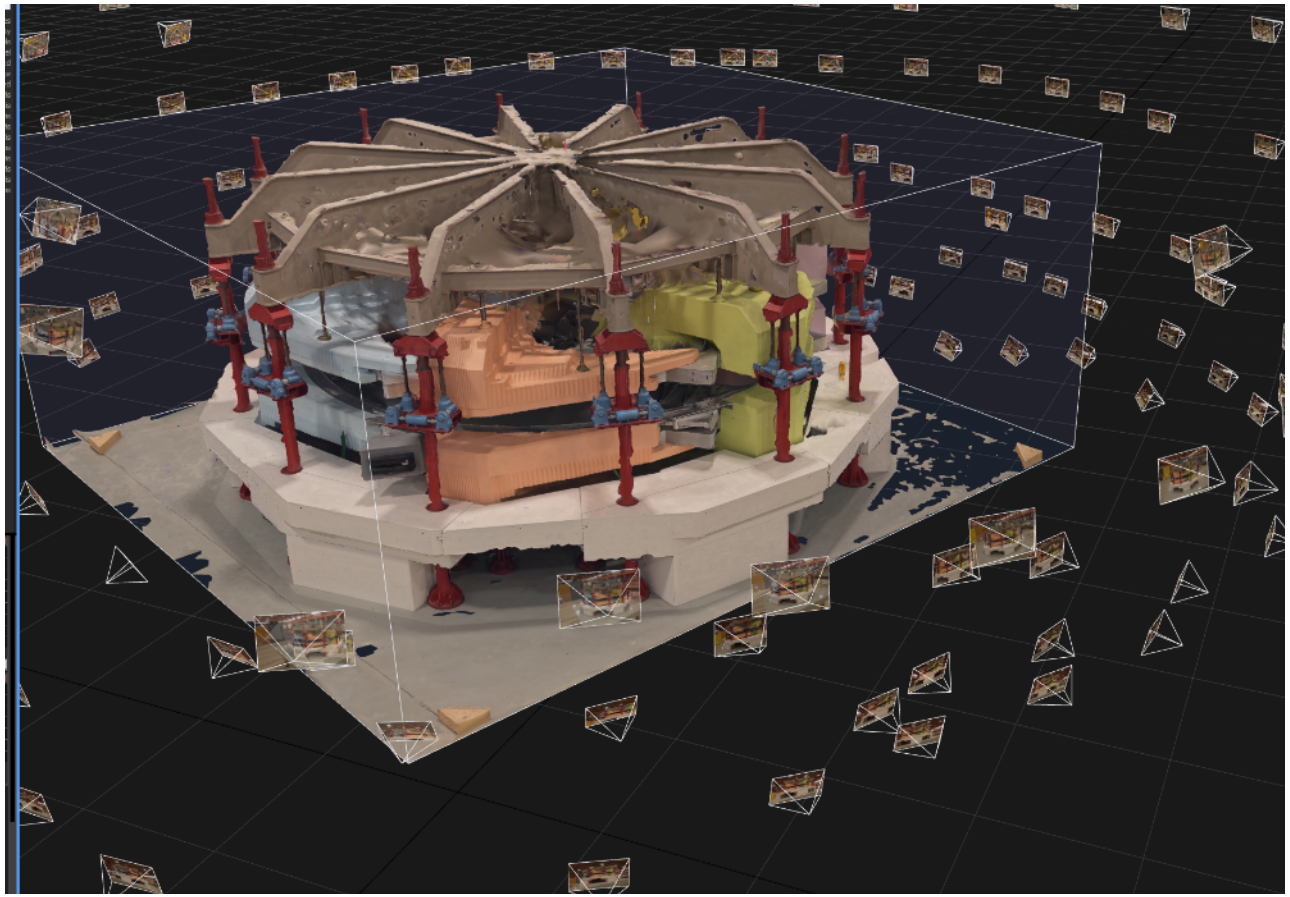
Kathryn Hayashi
(President and CEO, TRIUMF Innovations)

Program

- **Monday:** Reception
- **Tuesday:** AR/VR poster session
- **Wednesday:** Let's Talk Science competition for students (UBC PHAS)
- **Thursday:** Networking event and BBQ at UBC Farms + fun games
- **Friday:** TUG meeting

AR/VR Poster Session

- **Communications have** provided students with a set of novel interactive tools (Adobe's Aero)
- Scan **QR code** and view AR content
- Interaction with research apparatus
- Spotlights **Design Office** professionals & their work
- 11 teams (2-3 students each)
- Proof-of-concept for long term applications



AR/VR Poster Session

Ar

236 participants (**85** students, **103** staff and faculty & **48** online)

Science Week 2022

Iris Dillmann	Annika Lennarz	David Morrissey	Paul Schaffer
Beatrice Franke	Stephan Malbrunot-Ettenauer	Petr Navratil	Monika Stachura
Reiner Kruecken	Allayne McGowan	Marcello Pavan	Oliver Stelzer-Chilton
Bob Laxdal	Iain McKenzie	Thomas Planche	Hua Yang


TRIUMF

TRIUMF's Research

Both fundamental and applied, focus on discovery-driven research

- Expanding the boundaries of human knowledge
- Advancing the treatment of critical diseases
- Developing new technologies and innovations
- Deepening our understanding of the natural world

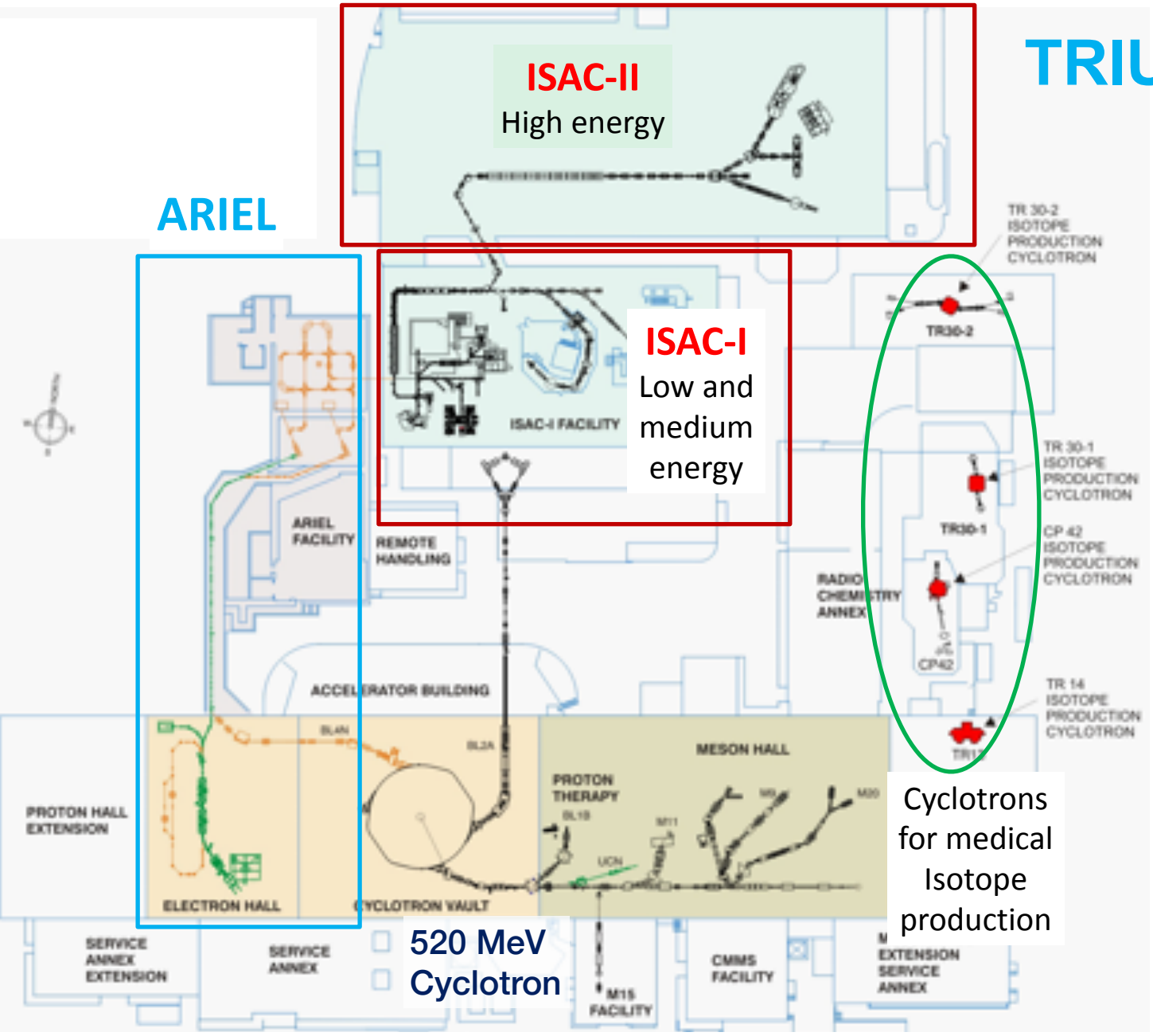
What is TRIUMF?

TRIUMF is Canada's particle accelerator Centre. Located in Vancouver, British Columbia, we are a world-class hub of research, education, and innovation

Founded in 1968 by three local Canadian universities as a nuclear physics laboratory, TRIUMF has evolved into a multidisciplinary facility owned and operated by a consortium of universities from coast to coast

TRIUMF

TRIUMF accelerator complex



Primary beam driver:

Cyclotron, 520 MeV, H^-

Produces rare isotopes, neutrons and muons!

Isotope Separator and Accelerator facility - ISAC

Isotope Separator Online (ISOL) facility

ISAC-I: Normal conducting-linac, 0.15-1.8 MeV/u

ISAC-II: Superconducting-linac, 1.5-16.5 MeV/u

Advanced Rare Isotope Laboratory - ARIEL

Superconducting electron linac

30 MeV, 10 mA, cw

4 Cyclotrons for medical isotope production

Discovery, accelerated

TRIUMF: Canada's Particle Accelerator Centre

Our multidisciplinary community uses our world-class accelerator infrastructure to drive leading-edge research that delivers impact in **science, medicine, and industry**

Member Universities

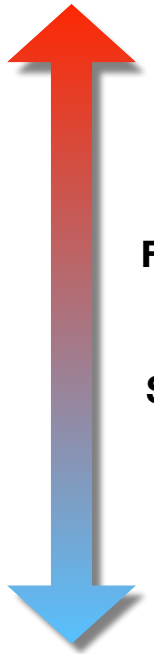
University of Alberta
University of British Columbia
Carleton University
University of Calgary
University of Guelph
University of Manitoba
McMaster University
Université de Montréal
Queen's University
University of Regina
Simon Fraser University
University of Toronto
University of Victoria
York University

It has been a major period of transition for TRIUMF over the last year

- Incorporation as a not-for-profit occurred on June 1st 2021
  - Two weeks after a new Director joined
- A new governance model has been introduced, with a new Board structure and processes, including a skills based approach to Board membership
  - New Board chair and vice-chair have been appointed (very engaged!)
- Major organisational structure changes, personnel changes and major transitions occurring in enterprise systems - introduced WorkDay last fall
- We have faced a rapidly changing environment and risks - CNSC reviews and relicensing, geopolitical shifts, increased focus on security and IP from governments and stakeholders
  - … and a pandemic which has stressed everything, including supply chains and resource availability
- Thanks to TRIUMF staff and community for successfully navigating a turbulent year

COVID Response

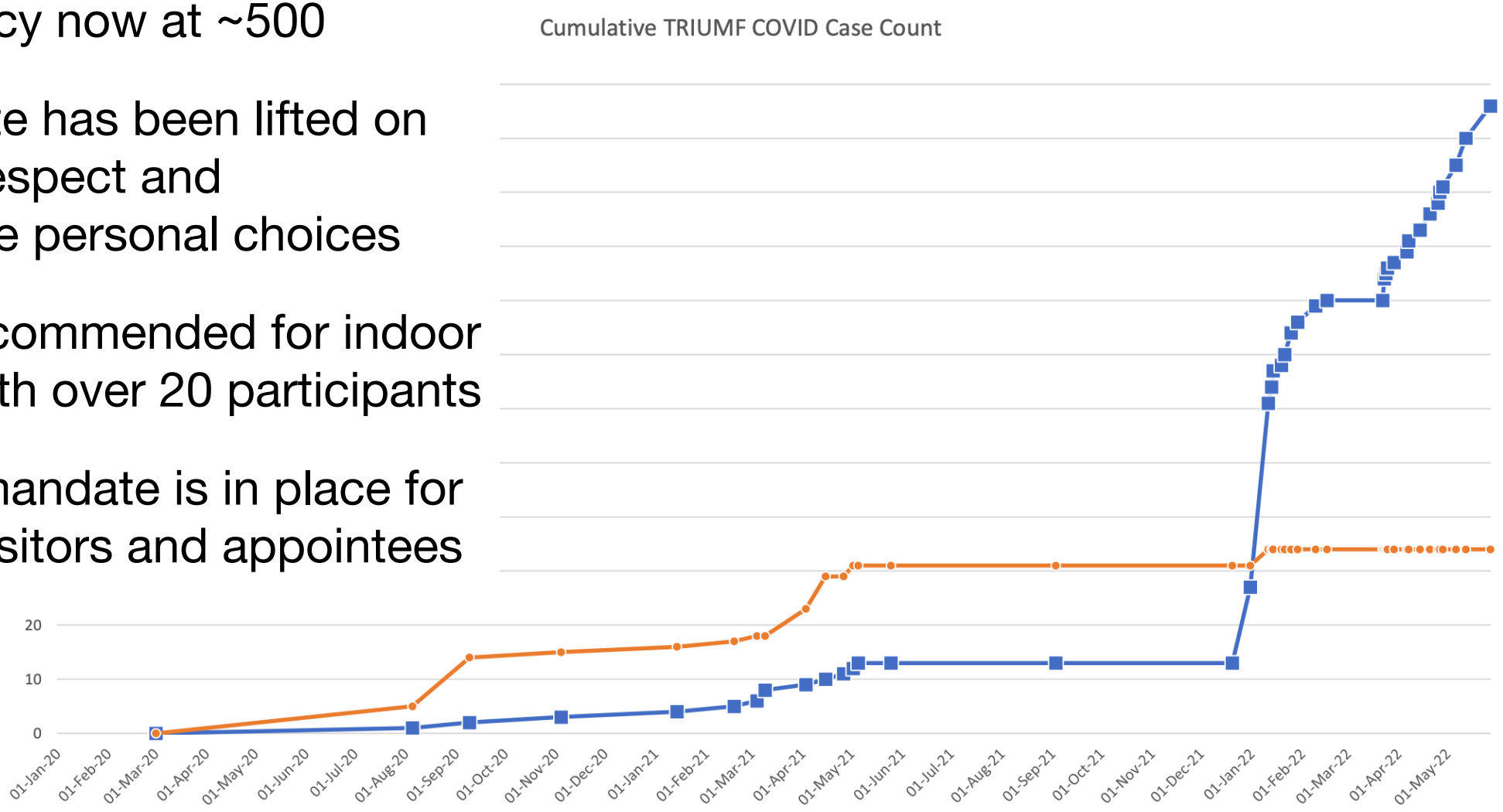
- TRIUMF has taken and will continue to take a measured, safety-first approach to deciding which measures to put in effect.
- Layers of COVID measures (order may change based on variants)
  - Site Occupancy Restrictions – Essential Staff only
  - Site Occupancy Restrictions – Remote Work recommendation
  - Room Occupancy Limits
  - Mandatory Mask Usage / Mask Recommendations
  - Vaccination Policy
  - Restricting Public Events
  - Restriction Friends and Family Tours



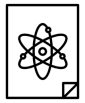
Factors: Regulations
TRIUMF Cases
Transmission
Severity Community

COVID Response

- Site occupancy now at ~500
- Mask mandate has been lifted on site, please respect and accommodate personal choices
- Masks are recommended for indoor gatherings with over 20 participants
- Vaccination mandate is in place for all TRIUMF visitors and appointees



TRIUMF KPIs

	Target	2018	2019	2020	2021
 published scientific papers	285	325	356	317	285
 highly qualified personnel trained	156	254	243	223	301
 Canadian scientists & students using TRIUMF	206	396	471	127	90
 Canadian scientists & students participating in research abroad through TRIUMF	195	227	227	224	224
 international visiting scientists & students	392	606	715	48	97
 informal science experiences to the public	15,000	15,367	16,503	8,375	10,327
 commercial revenues	$3.0M (net)	$4.7M ($3.7M net)	$4.4M ($2.6M net)	$5.4M* ($3.3M net)	$7.4M** ($5.4M net)

* Revised final audited figures (adjusted from $5.2M; $2.9M net)
** Preliminary figures

CNSC relicensing

- A major focus for many at TRIUMF over the last year was the relicensing by the CNSC for our accelerator operations (a ten year license expired end of June 2022)
- Public meeting was March 23rd (CLS, TRIUMF) and ran over three hours
- Key areas discussed included the management system, alignment to the N286-12 standard for nuclear facilities, conventional health and safety (including lost-time statistics), financial guarantees against decommissioning, and the amalgamation of TAI and TRIUMF
- CNSC staff were supportive of the ten-year renewal request; their presentation aligned very well with ours, and they identified areas we had struggled, our good progress in these areas, and our path forwards
- **Major Outcome:** TRIUMF's license has been renewed for a full ten-years to 2032, and the amalgamation of TAI and TRIUMF approved
    - Congratulations to all, and many thanks to everyone for the engagement in the process over the last year. A massive team effort that has a super outcome.

CNSC relicensing - decision details

the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, renews the Class IB particle accelerator operating licence issued to TRIUMF Accelerators Inc. for its particle accelerator facilities located in Vancouver, British Columbia. The renewed licence, PA1OL-01.00/2023, is valid from July 1, 2022 until June 30, 2032.

the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, transfers the renewed licence, PA1OL-01.00/2023, from TRIUMF Accelerators Inc. to TRIUMF Inc.

- **Management System**
  - The Commission highlights the importance of compliance with CSA N286-12 and expects TAI to meet the requirements of the standard in a timely manner.
    - the Commission agrees with CNSC staff's assessment that, despite TAI's incomplete implementation of CSA N286-12, TAI has an adequate management system in place to operate the facility
    - the Commission agrees with CNSC staff's assessment that TAI has an action plan in place to fully implement CSA N286-12 by 2023
    - CNSC staff will conduct increased oversight activities to verify TAI's timely implementation of N286-12
    - the Commission is satisfied that the evidence presented by TAI demonstrates that TAI has an acceptable safety culture and has implemented a sufficient plan to further improve
- **Occupational Health and Safety**
  - The Commission encourages TAI to compare its LTI statistics against industry-leading facilities to benchmark performance.
- **Decommissioning and Financial Guarantee**
  - The Commission directs the licensee to provide the original financial guarantee instrument documentation that conforms with G-206 within 90 days from the issuance of this Record of Decision.

Next Steps…

- The next interaction with CNSC was an audit on May 27th - June 8th, addressing similar themes to last February's audit
    - Aim was to show progress on the management system, alignment to N286-12, and commitment to the required regulator changes
- Feedback meeting was very positive: "TRIUMF is demonstrating adherence to its commitments, and are progressing towards N286-12 compliance"
    - Still much work to be done on some systems, but CNSC appreciative of strength of commitment from TRIUMF to resolve these issues. Focus on operational excellence is recognised and appreciated.
- CNSC will be back in September for next audit, and in Q1 2023 for full MS audit
    - The 10-year renewal will not diminish intent to achieve N286-12 compliance and operational excellence (good credibility has been created over the last year)

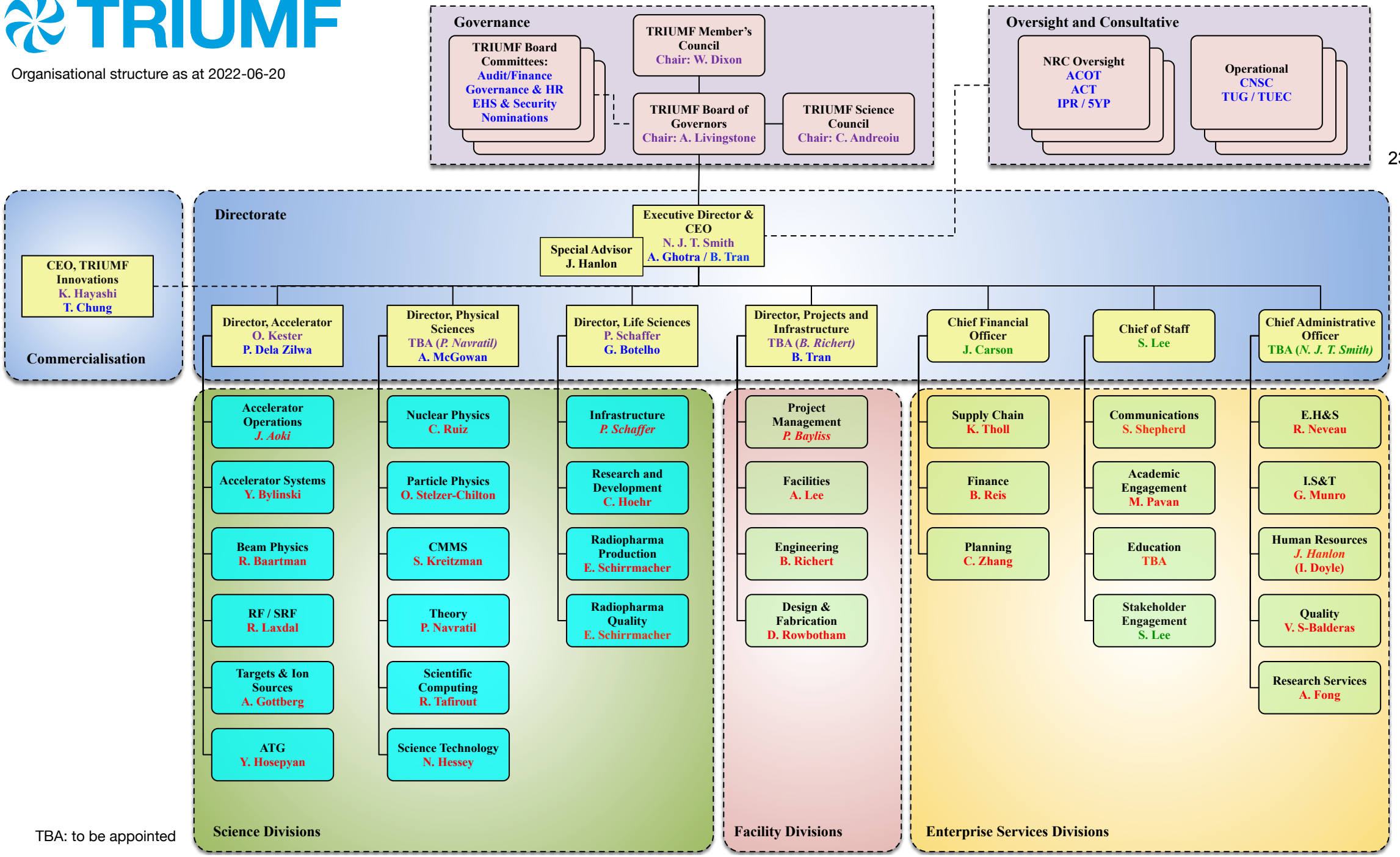
Organisational Restructuring

- On June 1, TRIUMF transitioned from a joint venture to an incorporated not-for-profit with charitable status. Changes to the governance model included:
    - a new Board of Governors (Smaller, skills-based, comprises ember University Representatives (5), UBC (1), Science Council chair (1) , External (4)) Chair: Angus Livingstone
    - Members' Council (Enables Member Universities to retain their ownership responsibilities, comprises member universities (14)) Chair: Walter Dixon (Alberta)
    - an advisory Science Council (Provides scientific advice and guidance to TRIUMF Board, comprises member universities (14), TRIUMF staff (5), External (5)) Chair: Corina Andreoiu (SFU)
- Major organisational restructuring occurred earlier this year, forming seven divisions plus TRIUMF Innovations

Current Org Structure

TRIUMF

Organisational structure as at 2022-06-20



TBA: to be appointed

Ombudsperson Role

TRIUMF's Ombudsperson (ombudsperson@triumf.ca)

- Dr. Grace Wong-Sneddon has been appointed into the role of ombudsperson;
  - an advisory role reports to the Executive Director
- This role is specifically in place to support students and postdoctoral fellows whose involvement with TRIUMF is connected to their academic pursuits, regardless of whether they have a formal agreement with TRIUMF

Bullying & Harassment

- TRIUMF released a new policy in February 2022; this represents a major update over the legacy policy. Key changes include:
  - Alignment with the latest legislation and best practices, including integrating "duty to report"
  - Reframes equity/inclusion as a core TRIUMF value and is present across many different polices

Equity, Diversity and Inclusion

Richard E. Azuma Undergraduate Summer Fellowship

- Actively recruits members of underrepresented groups who have experienced historically and/or current barriers to equity.
- Supports promising undergraduate students in Canada who are considering a career in research fields associated with TRIUMF's science program
- The 2022 fellowship was awarded to Gabby Gelinas to work on TITAN (May 2022) and Julia Azzi on DarkLight (Sept 2022)

Awareness Building

- Work continues on developing content and programming to broaden EDI awareness within the TRIUMF Community
- Recent activities include campaigns for International Day of Women and Girls in Science, Pink Shirt Day, and more

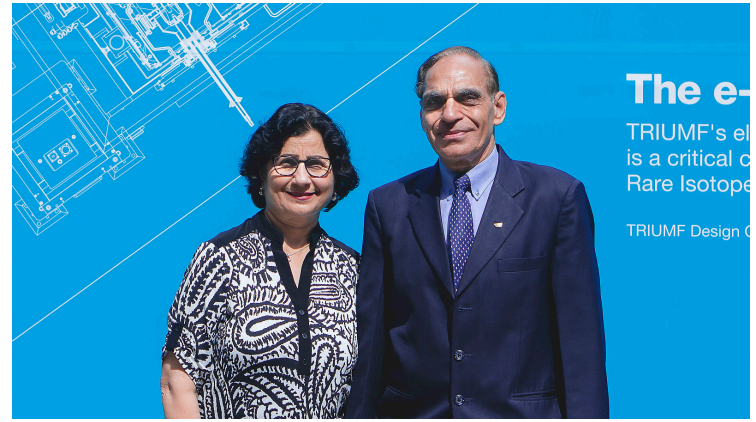
Undergraduate Programme

22/23 Summer Student Recruitment

- Hired a total of 54 students, including a few international students
- First intake done completely in Work Day
  - There were fewer applications this cycle (1449); we are looking into understand why
  - Demographic data from the applicants:
    - Male - 866
    - Female - 344
    - Non-Binary - 17
    - Prefer not to answer - 5
    - Blank - 217

Vijay Verma Scholar Award

- In January 2022, TRIUMF announced a new $25,000 endowment established by a TRIUMF Emeritus, Vijay Verma
- This endowment will support the Vijay Verma Scholar Award that will be given to one outstanding undergraduate student per year in the fields of engineering (specifically in the areas of accelerators and detectors), project management, computer science, or life sciences
- The inaugural scholar chosen is Nicolas Fedrigo



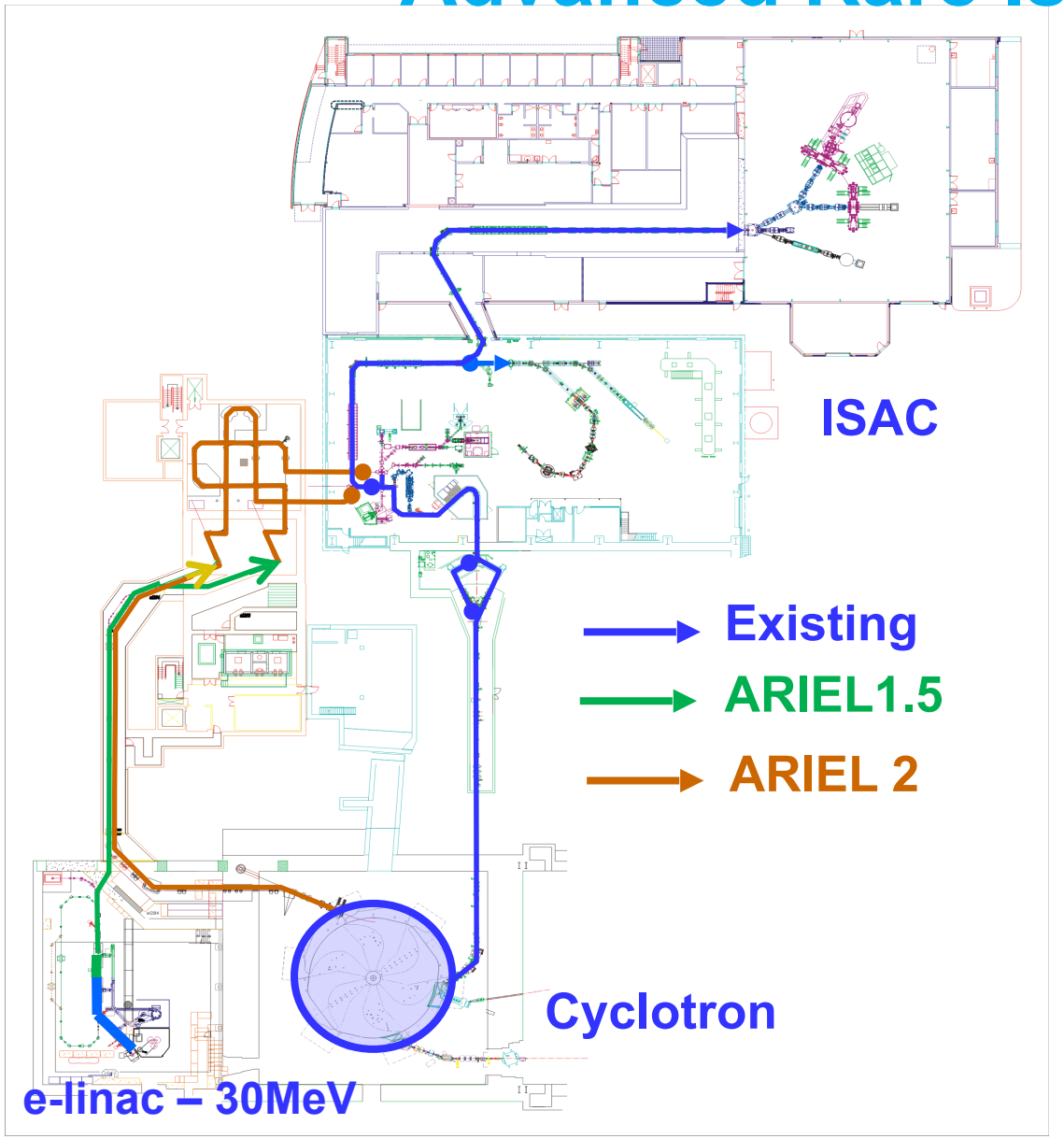
Quarterly Review of Projects and Priorities (QRPP)

- The QRPP is an open quarterly review of all projects by the Project Management Oversight Group (PMOG) and helps in the overall programme management
- An opportunity to re-assess the priority ranking of all projects and make prioritisation changes as needed, considering TRIUMF's Mission and its capabilities / capacity
  - This is not just based on the importance of the project, but includes timeliness of resource requirements, available resources, etc.
- First full QRPP was held on February 17th / 18th (now held… quarterly)
- Provided an overview of the TRIUMF programme, providing visibility to all of the entire portfolio, allowing PM team to identify potential resource conflicts during real-time discussion with colleagues

Programme Management

- PMOG has completed a ranking (twice) of all TRIUMF projects to create the prioritisation list. There are 85 projects having oversight through PMOG
- All projects are important, some just need priority when required to align with high level goals and objectives
- Natural groupings emerged, including NRC $25M projects, and 24 projects co-ranked as 60th
- ‘Live' document is on QuickLinks and available to anyone with a TRIUMF TRIDENT username

Advanced Rare Isotope Laboratory - ARIEL



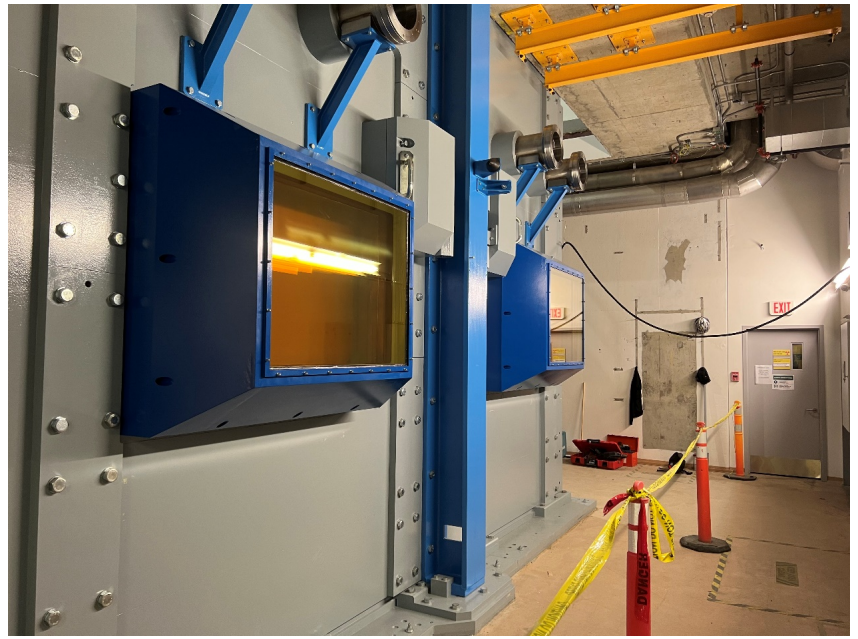
TRIUMF will transition into ARIEL:

- Multi-user, multi-disciplinary RIB Facility
- Intense, clean RIB beams into ISAC experiments:
  - New 30 MeV superconducting electron linac
  - New 100 kW electron beamline and target station
  - New 50 kW proton beamline and target station

Discovery, accelerated

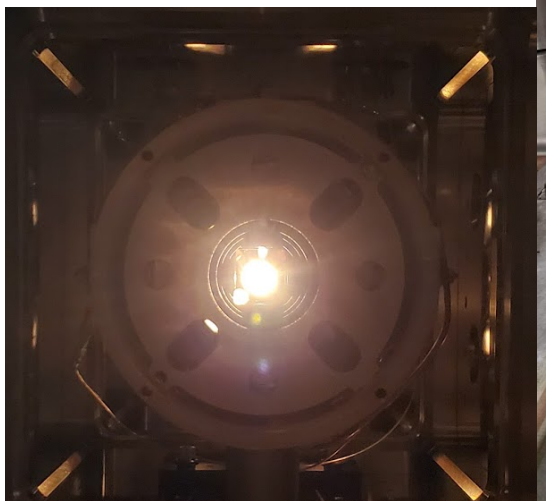
The ARIEL Hot Cell at TRIUMF

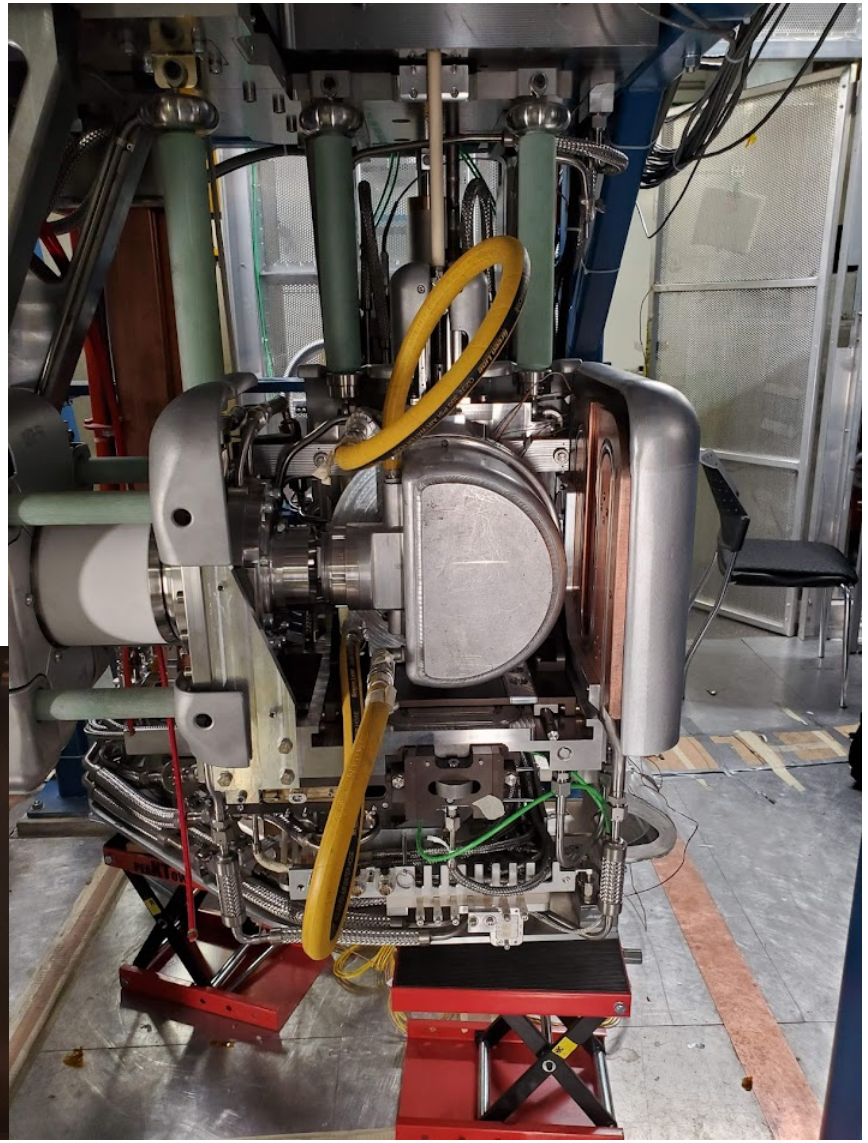
- The ARIEL hot cell#1 is required for
  - service at target modules (like to retrieve a stuck target assembly)
  - service at RIB and the convertor module
  - disassemble front end and packaging for disposal
- Despite setbacks due to global supply chain issues, the hot cell assembly is in progress and will be completed in August 2022



The ARIEL Target and Ion source Acceptance test-stand (TISA)

- The TISA test stand is in principle a copy of the core elements of the ARIEL target stations, intended to replicate some of their sections
- It is crucial to validate the design and performance of systems and components before going online at the AETE and APTW stations
  - Thermal Tests
  - Mechanical Tests
  - High Voltage Tests
- Target and ion-source were heated up to > 2000 °C
- Temperature of components were monitored in real-time to ensure the stability of the system and to avoid overheating





Institute for Advanced Medical Isotopes

- IAMI is a > $50M facility supported by the Government of Canada, the Province of British Columbia , BC Cancer, and UBC
- The Institute will serve as a global centre for nuclear medicine research and radiopharmaceutical development
- Full funding for the new facility was announced by PM Justin Trudeau on November 1, 2018 and work on the site is well advanced towards the completion of construction this summer

Institute for Advanced Medical Isotopes

- The building is in the process of fit-out; the TR-24 cyclotron was lowered into its vault on April 8 (and it fit!)
- Beamlines and ancillary systems installation underway
- TRIUMF-designed solid target station design/build effort underway
- GMP labs ready for hot cell installation

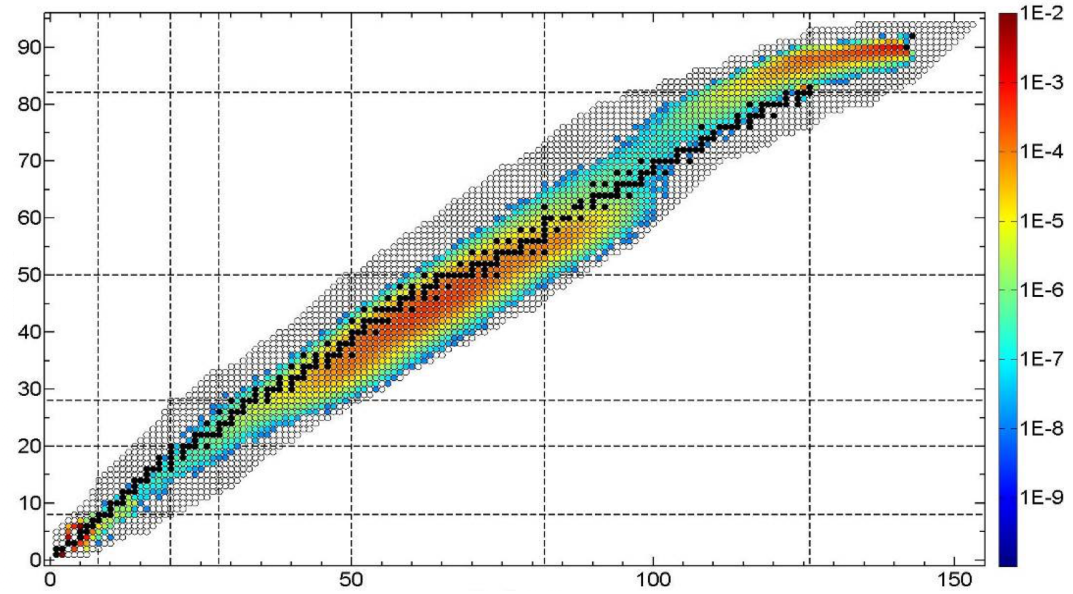
Therapeutic Isotope Production

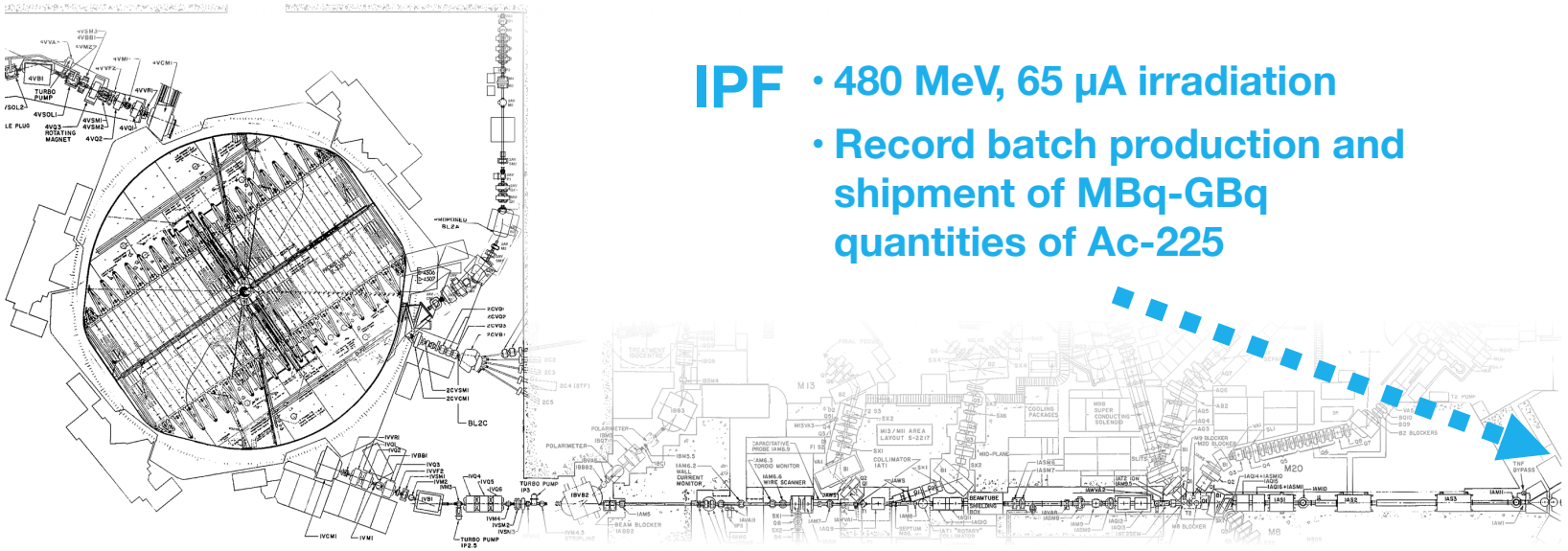
89

Ac

actinium

$[Rn]6d^{1}7s^{2}$





IPF

- 480 MeV, 65 µA irradiation
- Record batch production and shipment of MBq-GBq quantities of Ac-225

TRIUMF

TRIUMF

Science Week

July 18 - 22, 2022

Shaping
the future
of TRIUMF