Imagine Day 2025: Physics & Astronomy

An Introduction for Students to our Department faculty and staff, programs and courses.

UBC DEPARTMENT OF PHYSICS ASTRONOMY

Imagine Day – Physics and Astronomy

Schedule:

11:00 Introductions & Welcome

- General Program Information
- honours, Majors, Minors – Carl Michal
- Astronomy program – Aaron Boley
- Biophysics Program – Carl Michal
- Co-op Javed Iqbal
- Student Organizations/Initiatives:
  - CCUWiP 2025 – Airene and Jenny
  - Physsoc - Aakesh and Michael
  - WIPA - Marusia
  - Astro Club - Jaaron
  - Biophysics and Medical Physics – Elys & Isabella

12:00 Lunch

12:30 PHAS Equity, Diversity & Inclusion Committee – Jess McIver

Research In Physics & Astronomy

- Atomic, Molecular, and Optical Physics – Valery Milner
- Astronomy/Astrophysics – Aaron Boley
- Condensed Matter Physics & Quantum Information – Marcel Franz
- Particle Physics – Janis McKenna
- Bio & Medical Physics – Steve Plotkin
- Gravity & Strings – Moshe Rozali

1:30 Graduation and Beyond – Carl Michal

- Graduation requirements
- Getting into research
- Career options/Graduate School
- Grad School planning

~1:50 Student led Q&A

Introductions:

Jeremy Heyl – department head

Undergraduate chair: Carl Michal
1st -year advisor: Michael Hasinoff
2nd -year advisor: Ziliang Ye
3rd- and 4th-year advisor: Kristin Schleich
Astronomy advisor: Aaron Boley
Biophysics Advisor: Sabrina Leslie
Combined Major in Science: any PHAS Advisor

Communications coordinator: Kirsty Dickson
Program coordinator: Shawn Salgadoe ugcoord@phas.ubc.ca – next slide

All of us are here to offer advice, help with any program/course issues.

Shawn Salgadoe
Undergraduate Program Coordinator

Office: Hennings 329A

Office Hours: 8:30-4:30

Phone: 604-822-3026

Email: ugcoord@phas.ubc.ca

- General program inquiries
- PHYS & ASTR course registration issues
- Specialization applications and specialization changes
- USRA applications and other summer research opportunity enquiries
- Liaison between department, student clubs and students: student events mailing, etc.
- PLEASE: always include your student number in your emails to the department (in the Subject line is best!)

2nd Year: Gateway to PHAS programs

2nd Year – gateway to PHAS programs

In 2nd year, you entered one of our Programs:

- ★Honours Physics, Honours Physics & Astronomy
- ★Major Physics, Major Astronomy
- ★Combined Honours/Major Physics plus another Science
- ★Dual Degree Program – BSc (Physics) & BEd (Secondary)
  BSc (Physics) & B Arts
  BSc (Physics) & B Music
- ★You may be in another program doing a Minor in Physics

Or in 3rd year, you may enter:

Combined Major in Science & choose a Phys and Astro "package"

Graduation Requirements

You are responsible for knowing your graduation requirements.
Consult UBC Calendar:

www.calendar.ubc.ca/vancouver

You must follow all of the requirements from one year of the calendar (normally your 2nd year – when you entered the program

*No matter what you see on phas.ubc.ca (which we to try to keep up to date) or anywhere else on the web, the **UBC calendar is 'the rule book'** and defines what is required to get a degree from UBC.

In the calendar, see: “Faculties, Colleges, and Schools” -> Science
- BSc requirements for Faculty of Science rules & Requirements
- “Physics” or “Astronomy” for specific program requirements.

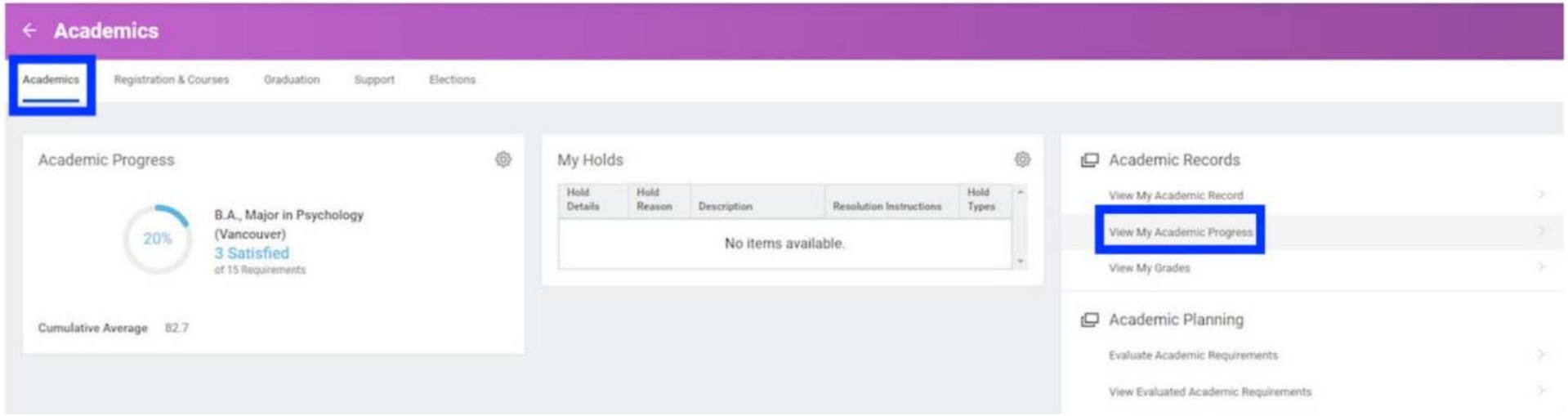
Graduation Requirements

You are responsible for knowing your graduation requirements.
Consult UBC Calendar:
www.calendar.ubc.ca/vancouver

Google “UBC calendar Physics” or “UBC calendar Astronomy”

Arts Electives, Science Electives, Science Breadth Requirement, Communication/English requirements are all necessary to graduate.

Use “Academic Progress” in Workday to help you check that you’re meeting your program requirements. At end of 3rd year get a “Graduation Check” from Science Advising, and/or our PHAS Undergraduate Co-ordinator



Imagine 2nd year - Physics & Astronomy

BSc Graduation Requirements

Summary of Program Requirements Science

	Major, Combined Major, or General Science	Major+Minor in Science	Major+Major (Science)	Honours or Combined Honours	Honours+Minor in Science
Minimum Total Credits	120	120	120	132	132
of which courses 300+	48	48	60	48	60
Minimum Total Science Credits	72	72	72	72	72
of which courses 300+	30	42	54	42	54
Minimum Total Arts Credits	12	12	12	12	12
Maximum Credits that can be double counted	-	6	6	-	6
Maximum credits not in Science or Arts	24	24	24	24	24

All Majors BSc: 120 credits

All Honours BSc: 132 credits

Science Breadth requirement Majors, Honours: 3 cr from 6 of the 7 Science Categories
Combined Majors, Combined Honours: 3 cr from 5 of the 7 Science Categories

Categories: MATH, PHYS, CHEM, CPSC, (STAT/DSCI)*, BIOL*, (EOSC/ASTR/ATSC,GEOB,ENVR)*
* some special cases/exceptions, see
https://vancouver.calendar.ubc.ca/faculties-colleges-and-schools/faculty-science/bachelor-science/science-breadth-requirement

Honours

For those considering a career in research and/or continuing to graduate school.

Honours degrees require a 6 credit Honours thesis.

- Honours Physics
- Honours Biophysics
- Honours Physics and Astronomy
- Honours Physics and Mathematics
- Honours Computer Science and Physics
- Honours Chemical Physics
- Honours Physics and another Science Subject

(We can help you formulate and get approval for a program which meets all Honours requirements, Faculty of Science requirements and UBC graduation requirements)

All Honours Science Degrees:

- **Must take at least 27 credits Sept-April (or 12 credits/term if co-op)**
- **Must maintain average >68% each academic session**
- **Must not fail any courses.** **(exceptions may be possible via appeal)**

Major Degrees

★**For those intending to enter career in science/technology, education, science-related.**

★MAJOR is NOT the recommended stream for graduate studies, although Majors who take ALL the core senior honours physics courses + have research experience have been accepted to graduate schools.

★Offers more flexibility than Honours (more electives)

★Fewer total credits (120 in Major, 132 in Honours)

★"Easy" to fit in a Minor (Minor could be in Arts, Commerce, Science, + more)

- Major Physics
- Major Astronomy
- Combined Major Physics and Computer Science
- Combined Major Physics and Oceanography
- Double Major in Science and Arts

Dual Degree

★**For those intending to add a second specialization outside of Science.**

★NOT the recommended stream for graduate studies, although students who take all core senior honours physics courses may be accepted to graduate schools.

- Dual Degree Science and Arts BSc (Physics) & BA
- Dual Degree Science and Music BSc (Physics) & BMus
- Dual Degree Science and Education

  5 year program:

  Dual Degree Program: BSc (Physics) BEd (Secondary)

Graduate with qualifications/certification to accept teaching position

Combined Major in Science

http://cms.science.ubc.ca/

- ★Broad-based Science education
- ★Maximum flexibility, allows for large breadth
- ★Choose 3 CMS “packages” or specializations
- ★**NOT** for those planning for graduate studies in Physics/ Astronomy

Physics and Astronomy CMS Package

1. Physics Option

Prerequisites: MATH 200; PHYS 117 (or 101 or 107); PHYS 118/119 (or 102 or 108/109); PHYS 200. PHYS 219, 229 and MATH 215 recommended

Package Courses: 3 credits of PHYS numbered 300 or higher (except: PHYS 348) and 6 credits PHYS or ASTR courses numbered 300 or higher (except: PHYS 348).

Recommended Courses: PHYS 301, 304, 305, 309, 312, 314, 315, 318, 319, 330, 333, 404, 405, 420

2. Astronomy Option

Prerequisites: (MATH 200, MATH 317) or MATH 217; MATH 215; PHYS 117 (or PHYS 101 or PHYS 107); PHYS 118 (or PHYS 102 or PHYS 108); PHYS 200; PHYS 203; PHYS 216. PHYS 210, ASTR 200, and ASTR 205 recommended

Package Courses: 6 credits from ASTR 300, 333, 403, 406, 407 and 3 credits of PHYS numbered 300 or higher

Other “Packages”:
Chemistry, Earth/Environmental Science, Life Science, Mathematical Science

Minor (outside Physics/Astronomy)

★Pick up a second specialization

★Relatively easy to add a Minor to a Major Physics or Major Astronomy due to more flexibility in Majors program and courses

★With planning: add a Minor to Honours Physics

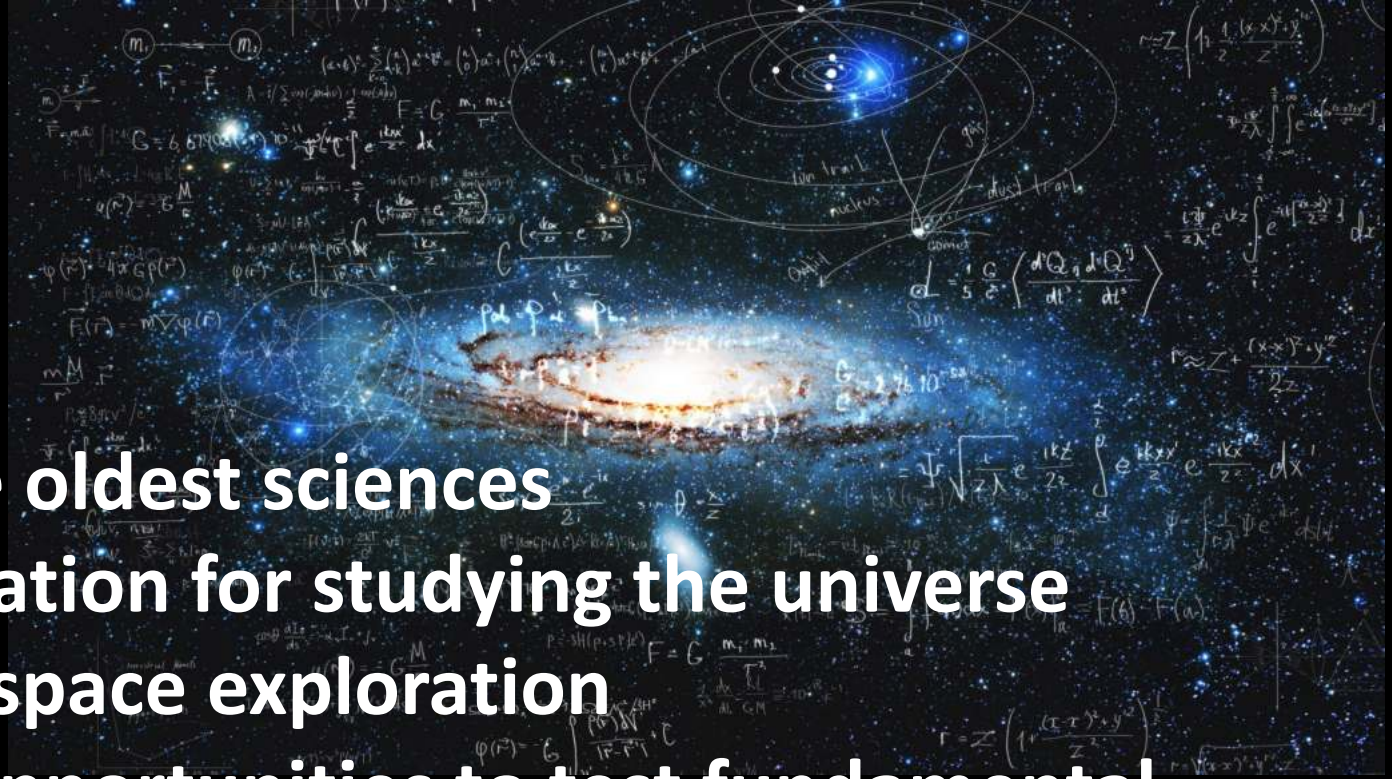
★Not much "elective room" to add a minor to Combined Honours or Combined Majors program – but it has been done.

- Minor in another Science
- Minor in any Arts subject (Economics, Philosophy, a language, often seen in PHAS, but any Arts minor possible)
- Minor in Commerce
- Minor in Human Kinetics
- Minor in Land and Food Systems

Typically need 18 upper level (300- 400-level) credits
Some Arts Minors require 30 credits, 18 of which must be upper level.

To apply for Minor: download forms from Faculty Science website.

Astronomy



- One of the oldest sciences
- The foundation for studying the universe
- Critical to space exploration
- Provides opportunities to test fundamental physical laws
- Fully integrated into society

Astronomy specializations at UBC

(See: https://phas.ubc.ca/undergrad-degree-programs)

Astronomy Major

Career options include: technical support personnel at domestic and international observatories, astronomy educators, and outreach experts at science centres and planetaria. The diverse skills acquired in this specialization are attractive to non-academic employers – space industry, Earth obs., etc.

Combined Honours Physics and Astronomy

Intended for students who want to go on to graduate studies in Astronomy and Astrophysics (or other areas of Physics, depending on upper-level electives). A Ph.D. is generally a requirement to be a scientist at a research institute or observatory, or to be a professor at a university.

Also available: Co-op, Minor, CMS

Astronomy Courses at UBC

Course #	Name	MAJ	HON
ASTR 101	Intro to the Solar System		
ASTR 102	Stars, galaxies, cosmology		
ASTR 200	Frontiers of Astrophysics	X	X
ASTR 205	Stars and Stellar Populations	X	X
ASTR 300	Galaxies	X	X
ASTR 333	Exoplanets and Astrobiology		
ASTR 403	Cosmology		Rcmnd
ASTR 404	Astronomical & Astrophysical Measurements	X	X
ASTR 405	Astronomical Lab	X	X
ASTR 406	High-Energy Astrophysics	X (or 407)	X
ASTR 407	Planetary Science	X (or 406)	X
PHYS 449	Directed Research in Astronomy		X

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ASTR 300	Galaxies	X	X
ASTR 333	Exoplanets and Astrobiology		
ASTR 403	Cosmology		Rcmnd
ASTR 404	Astronomical & Astrophysical Measurements	X	X
ASTR 405	Astronomical Lab	X	X
ASTR 406	High-Energy Astrophysics	X (or 407)	X
ASTR 407	Planetary Science	X (or 406)	X
PHYS 449	Directed Research in Astronomy		X

Useful but not required

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ASTR 205	Stars and Stellar Populations	X	X
ASTR 300	Galaxies	X	X
ASTR 333	Exoplanets and Astrobiology		
ASTR 403	Cosmology		Rcmnd
ASTR 404	Astronomical & Astrophysical Measurements	X	X
ASTR 405	Astronomical Lab	X	X
ASTR 406	High-Energy Astrophysics	X (or 407)	X
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PHYS 449	Directed Research in Astronomy		X

Useful but not required

Start of specialization

Astronomy Courses at UBC

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ASTR 102	Stars, galaxies, cosmology		
ASTR 200	Frontiers of Astrophysics	X	X
ASTR 205	Stars and Stellar Populations	X	X
ASTR 300	Galaxies	X	X
ASTR 333	Exoplanets and Astrobiology		
ASTR 403	Cosmology		Rcmnd
ASTR 404	Astronomical & Astrophysical Measurements	X	X
ASTR 405	Astronomical Lab	X	X
ASTR 406	High-Energy Astrophysics	X (or 407)	X
ASTR 407	Planetary Science	X (or 406)	X
PHYS 449	Directed Research in Astronomy (Thesis)	PHYS/ ASTR 349	X

Useful but not required

Start of specialization

Notes regarding 349 and 449

- PHYS 449 (for astro, too)
  - Reserved for Combined Honours Students.
  - In special cases, majors students are allowed into 449, but this is usually by request from the supervisor
  - Thesis class. 6 credits. Two terms

- ASTR 349/PHYS 349
  - As a department policy, this course is used for masters students to mirror PHYS 449.
  - Take part in the full course
  - Thesis class. 3 credits. Two terms

Students are not allowed to take both PHYS 449 and ASTR/PHYS 349 as “extra thesis”

Astronomy Opportunities at UBC

- Wide range of research topics (discussed later)
- A 0.5 metre optical telescope in Chile for student training and research (Thunderbird South) – Look out for announcements about the operators
- A Small Radio Telescope on the roof of Hebb for student training
- Many opportunities to get involved with using different facilities in Canada and throughout the world!
  - LIGO
  - CHIME
  - Green Bank Telescope
  - ALMA
  - CFHT
  - Gemini
  - Hubble
  - JWST
  - Euclid
  - Chandra
  - Eventually Square Kilometre Array and a very large optical telescope
  - Supercomputing facilities, too!

Thunderbird South image of the Pillars of Creation

Sean Heakes & Chantal Hemmann

Astronomy Career Information

- https://casca.ca/?page_id=93
- https://aas.org/learn/careers-astronomy
- https://ras.ac.uk/education-and-careers/careers

Astronomy Advising

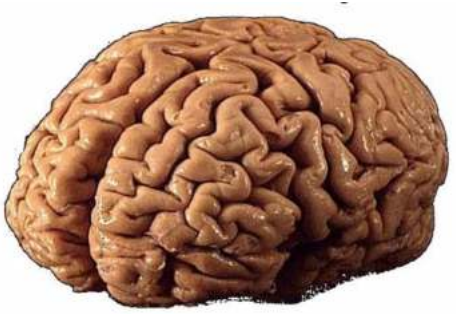
Prof. Aaron Boley
Hennings 320A
ug-astr@phas.ubc.ca

Combined Honours Biophysics Program

- **What is Biophysics?**
  - **An interdisciplinary science that applies theories, concepts and methods of physics to questions of biology.**

Biophysics: Big Questions

- How does life work?
- The Protein Folding Problem
- (How) has biology exploited quantum mechanics to tailor biological function?
- Neurobiology: how does the brain work? How do we learn? Neuroplasticity?



The Honours Biophysics Program

1. Defined set of courses in Physics and Mathematics, for example:
   - PHYS 301 Electricity & Magnetism
   - PHYS 304 quantum Mechanics
   - PHYS 305 Biophysics
   - MATH 300 Complex Variables
   - MATH 316 Partial Differential Equations

2. Flexible life Science component: 18 credits of life sciences that you choose. Usually structured to emphasize one of:
   - Molecular and cell biology
   - Macrobiology (organism level)
   - Applied biology (e.g., medical applications)

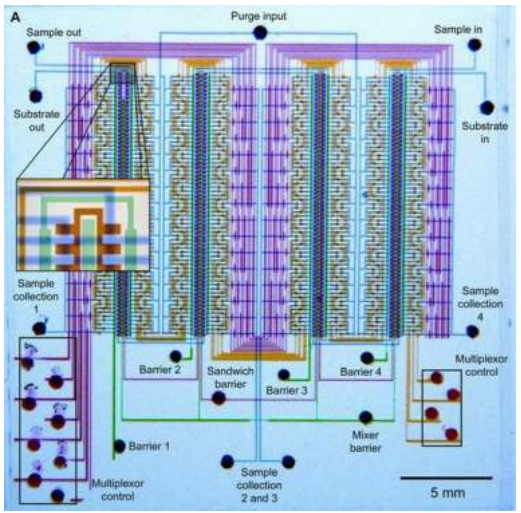
3. Honours Thesis

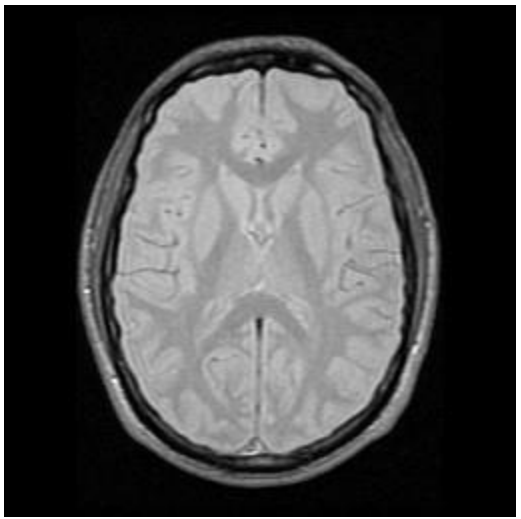
*This is a diverse program, including: Physics, Math, Chemistry, Biochemistry and Biology!

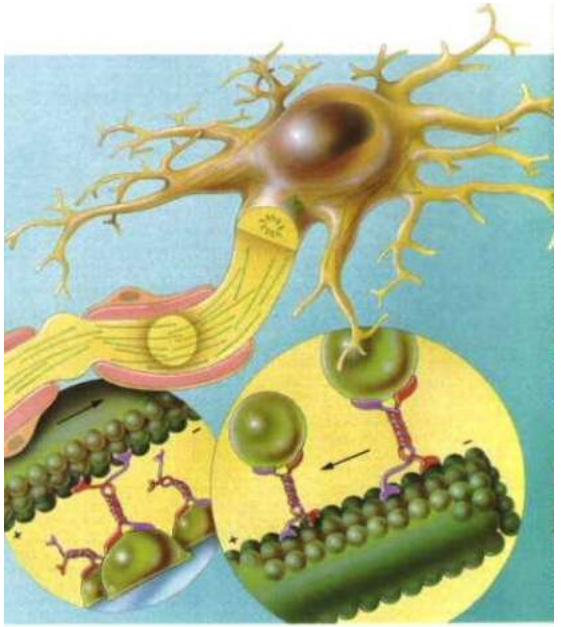
Who is the Biophysics program for?

Anyone interested in how physics and physics approaches can be applied to problems in the life sciences.

Students interested in upper level courses in all of PHYS, MATH, BIOC, BIOL (and optionally: CHEM, CAPS, MICB, PCTH, MEDG)







Biophysics: What do Biophysics Program Graduates do after graduation?

Most continue their education:

Graduate School:

- Biophysics – Mechanical Engineering (orthopaedics)
- Medical Physics - Pathology
- Biochemistry – Experimental Medicine
- Neuroscience – Epidemiology
- Education

Medical School

Entrance into the Biophysics program:

For entry in **second** year, apply through the Faculty of Science.

The biophysics program is an Honours program. To remain in the program, UBC Science requires:

- Complete all courses attempted
- Complete a minimum of 27 credits per Winter session (often more are needed)
- Maintain a minimum of 68% average in each academic session.

Entrance into the Biophysics program:

Entrance in **third** year is possible, at the discretion of the PHAS Biophysics and Undergraduate advisors.

Requirements:

- Average of at least 72% in second year
- Have never failed a course
- Taken a minimum of 27 credits in second year
- Course selections to date appropriate for the Biophysics program

*These are minimum requirements. Applications are considered on a case by case basis.

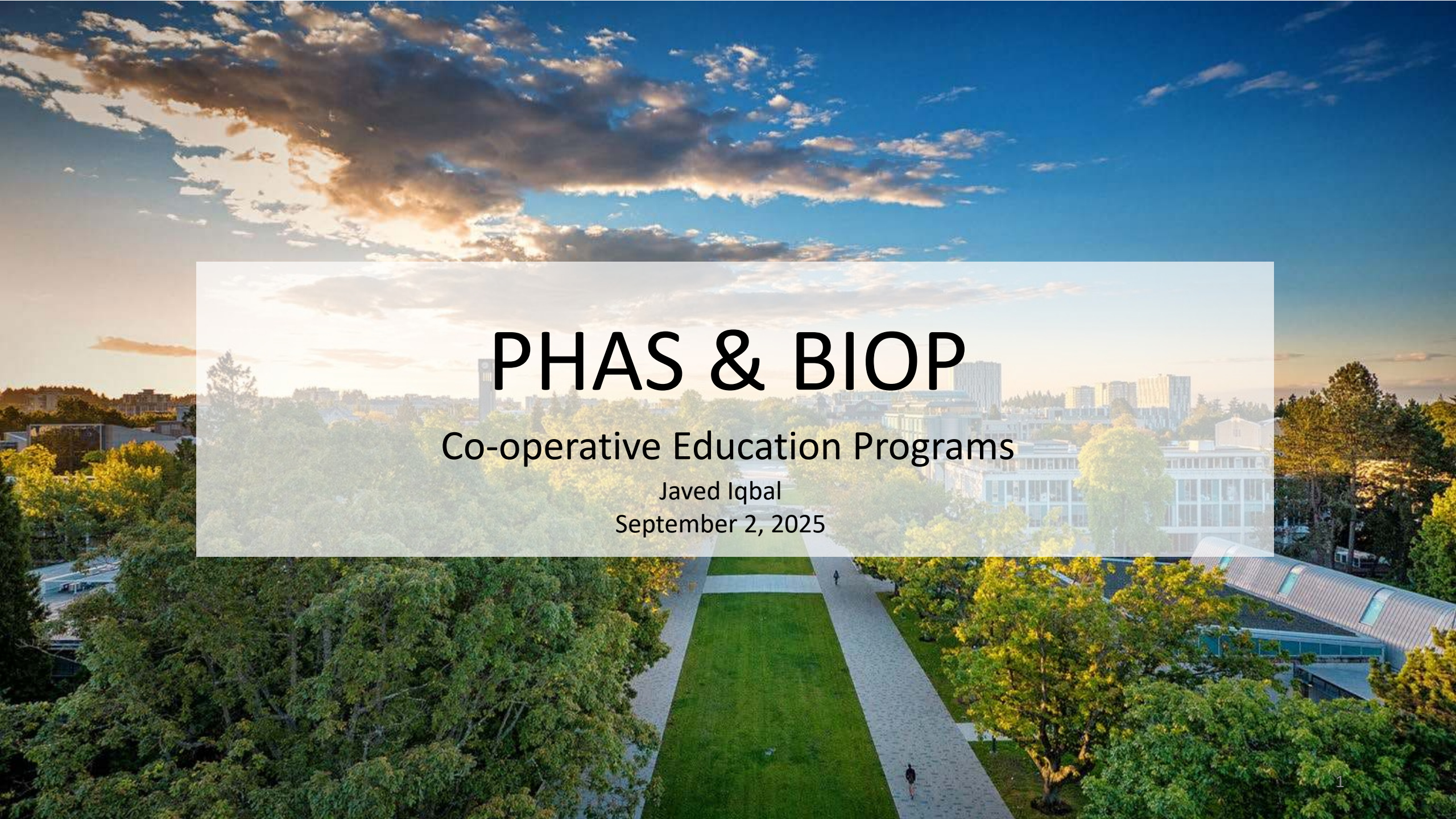
Recommendations:
Follow as closely as possible the program outlined for the Honours Biophysics program in the second year.

Some missed courses can be taken in summer.
http://phas.ubc.ca/undergrad-honours-biophysics

Biophysics: Support is available:

- Biophysics is a small program and traditionally very close-knit
- Biophysics & Medical Physics Student Society, also PHYSSOC:
  - Get to know older students who've been through it before
  - Help with studying
  - Social activities
- Department advisors and course instructors
- Science advising centre
- Science Support programs: http://science.ubc.ca/students/resources

*Any other questions: please email the program advisor, Sabrina Leslie at: ug-biop@phas.ubc.ca /



PHAS & BIOP

Co-operative Education Programs

Javed Iqbal

September 2, 2025

What is Co-op?

- **Integration of academic studies with relevant, supervised, full-time and paid** work experiences within student's field of studies
- **16 months** to obtain a Co-op designation (4, 8, 12 or 16-month placements)
- **Multiple placements** with different employers

Average monthly salary for PHAS & BIOP Co-op: $3,300

Benefits of Co-op Education

- Practical work experiences
- Opportunity to work on real-life problems
- Focused education
- Increased job prospects after graduation
- Informed decisions about graduate studies
- Networking
- Life skills

Schedule I (1st Year PHAS)

Year	Term1	Term 2	Summer
1	ST 1	ST 2/apply	
2	ST 3	WT1	WT2
3	ST 4	ST5	WT 3
4	WT4	ST 7	WT 5
5	ST 7	ST 8	

Schedule II (3rd Year PHAS & BIOP)

Year	Term1	Term 2	Summer
1	ST 1	ST 2	
2	ST 3	ST 4	
3	ST 5/apply	ST 6	WT 1
4	WT 2	WT 3	WT 4
5	ST 7	ST 8	

What Employers Look For?

- Good grades (keep you GPA around 80%)
- Computational skills

  PHYS 210/310,

  CPSC 103/107/110/203,210,…

  DSCI courses
- Personal projects
- Problem solving skills
- Enthusiasm, energy, communication skills, ..

Program Fees

- Co-op Admin & Workshop fee: $ 282.75
- Co-op work term fee: $ 871.75/ WT
- Total cost (4 WT): $ 3,770

Next Application Deadlines

- Year 2 & 3 students: October 1, 2025
- Year 1 & 2 students: March 4, 2026

Thank you!

iqbal@phas.ubc.ca
604-822-2465

CCUW*iP 2026

Canadian Conference for Undergraduate Women & Gender Minorities in Physics

Jenny Zhu and Airene Ahuja

THE UNIVERSITY OF BRITISH COLUMBIA

Physics and Astronomy
Faculty of Science

Canadian Association of Physicists

Conference Details

Date: Friday January 30th - Sunday February 1st, 2026

Purpose: Connect students & professionals through research, networking, and diversity discussions

Events: Keynote lectures, banquet dinner, panels and workshops, oral/poster presentations, graduate school/career fair, and lab tours!

Audience: Organized by and for equity-deserving groups, with registration open to all physics, astronomy, and engineering physics students

Hiring for Organizing Committee!

Media Coordinator (1)

- Creating promotional content, managing social media accounts and CCUW*iP 2026 website, designing merchandise, event documentation.

Internal Coordinator (1)

- Taking meeting minutes, recruiting volunteers and managing their training, booking rooms, keeping track of planning timeline

External Coordinator (1)

- Reaching out to guest speakers, panelists, and workshop hosts, finding and negotiating sponsorships, finding catering and accommodations for the conference

Treasurer (1)

- Ensuring we’re within budget, tracking funding/expenses, applying for grants

Contact us!

CCUW*iP 2025 at University of Calgary

More info coming soon:
https://ccuwip.cap.ca/

Questions? Email us at ccuwip@phas.ubc.ca

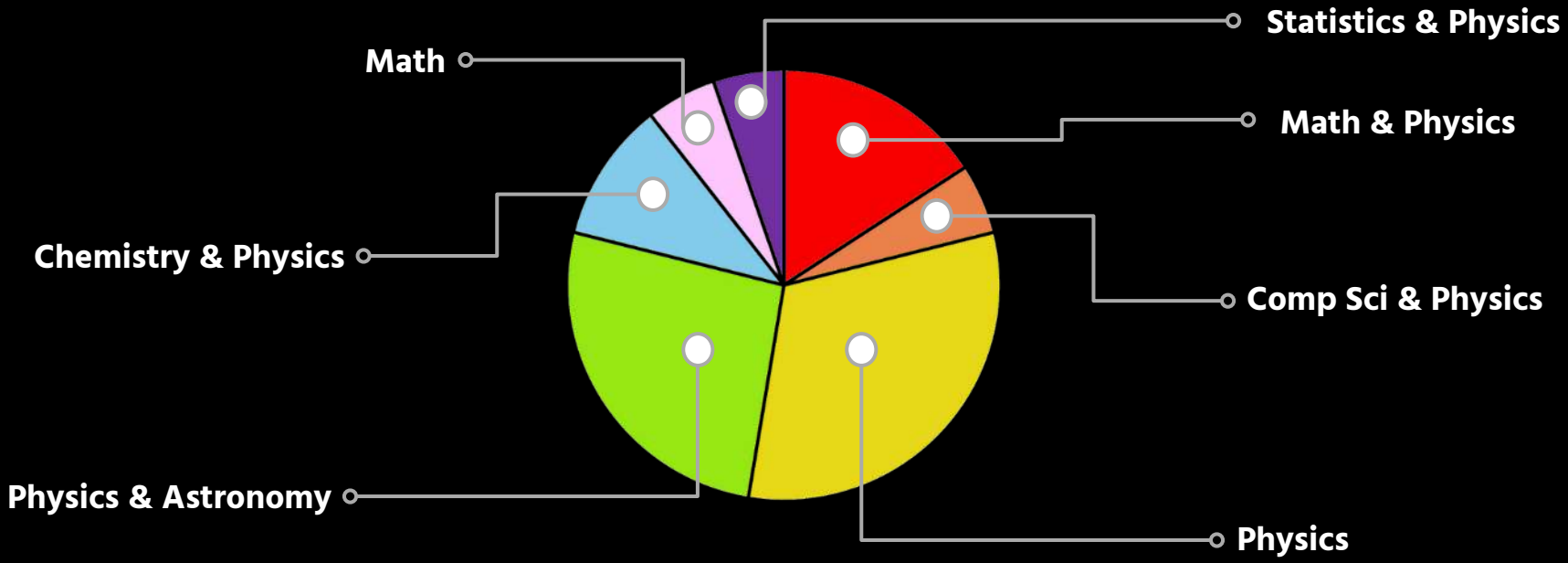
Apply to join the organizing committee:

UBC PHYSICS SOCIETY

Aakash & Michael

- Founded in 1930
- 18 Council Members
- $10 Membership Fees

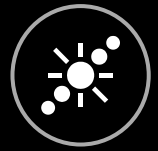
STATS ABOUT US:



LOOK FORWARD TO...

BEEF & PIZZA

CHAT W/ PROFS



WINE & CHEESE

ACADEMIC WORKSHOPS

SOCIAL EVENTS

COLLAB EVENTS

LOOK FORWARD TO...

24/7 CARD ACCESS

... and other membership perks!

OUR LOUNGE - HENN 307

Study Spaces, Snacks, Kitchenette, Foosball, Textbook Library

PHYSSOC IMAGINE DAY:

Find us at our booth next to the Alumni Centre!

THANKS!

Discord

Instagram

Website

CONTACT US:

Lounge: HENN 307
Email: physsoc@phas.ubc.ca
Website: physsoc.phas.ubc.ca
Instagram: @ubcphyssoc

UNIVERSITY OF BRITISH COLUMBIA
PHYSICS SOCIETY

Building community, connection, and support for women and gender-diverse people in PHAS!

✨ Who we are ✨

- A new club open to **women, gender-diverse students, and allies**
- Goal: Create a **supportive & inclusive community**
- **Diverse exec team** of 10 students

Our Co-Founders

Marusia Shevchuk

Abilene Jull

✨ Our Plans ✨

Community & Fun

- Visit our **Imagine Day booth!**
- Join us at our **Fall Welcome Event** in late September!
- Look out for fun events like **movie and craft nights!**

Academic & Networking

- **Panels** and **info. sessions** with profs, grad students, and alumni!
- **Mentorship nights!**
- **Study nights** throughout the year!

How to get involved

Give your Input!

Check out our Website!

UBC Astronomy Club

OVERVIEW

CONTACT@UBCASTRONOMYCLUB.COM

Who we are

EVENTS WE HOST

EVENTS WE HOST

- **Flash Observations**

EVENTS WE HOST

- **Flash Observations**
- **Academic lectures**

EVENTS WE HOST

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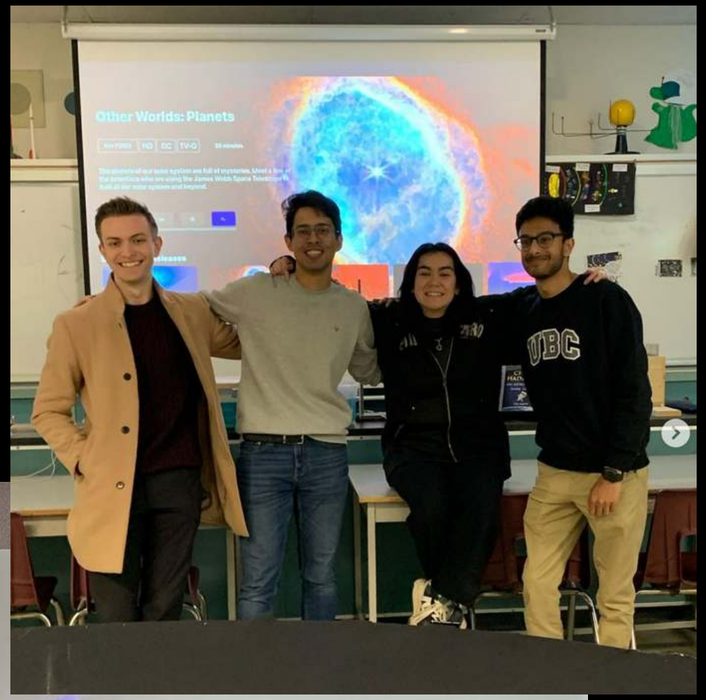
- **Academic lectures**
- **Astrophotography workshops**

EVENTS WE HOST

- **Flash Observations**
- **Academic lectures**
- **Astrophotography workshops**
- **Social events + school trips**



EVENTS WE HOST

- Flash Observations
- Academic lectures
- Astrophotography workshops
- Social events + school trips
- Dark Sky trips

MEMBERSHIP BENEFITS

(In addition to our events)

- Free telescope rental program
- Priority access to our dark-sky trips and other ticketed events
- Discounts at telescope shops
  - Markarian Fine Optics (Vancouver)
  - All-Star Telescopes (Calgary)
- Discounted club merch

FAQ

Do I have to be in the Department of Physics and Astronomy to join?

Do I have to be a student to join?

How much are memberships?

What is the time commitment?

How can I get involved with planning Astronomy club events?

THANK YOU!

For any inquiries, please don't hesitate to contact us via email:

contact@ubcastronomyclub.com

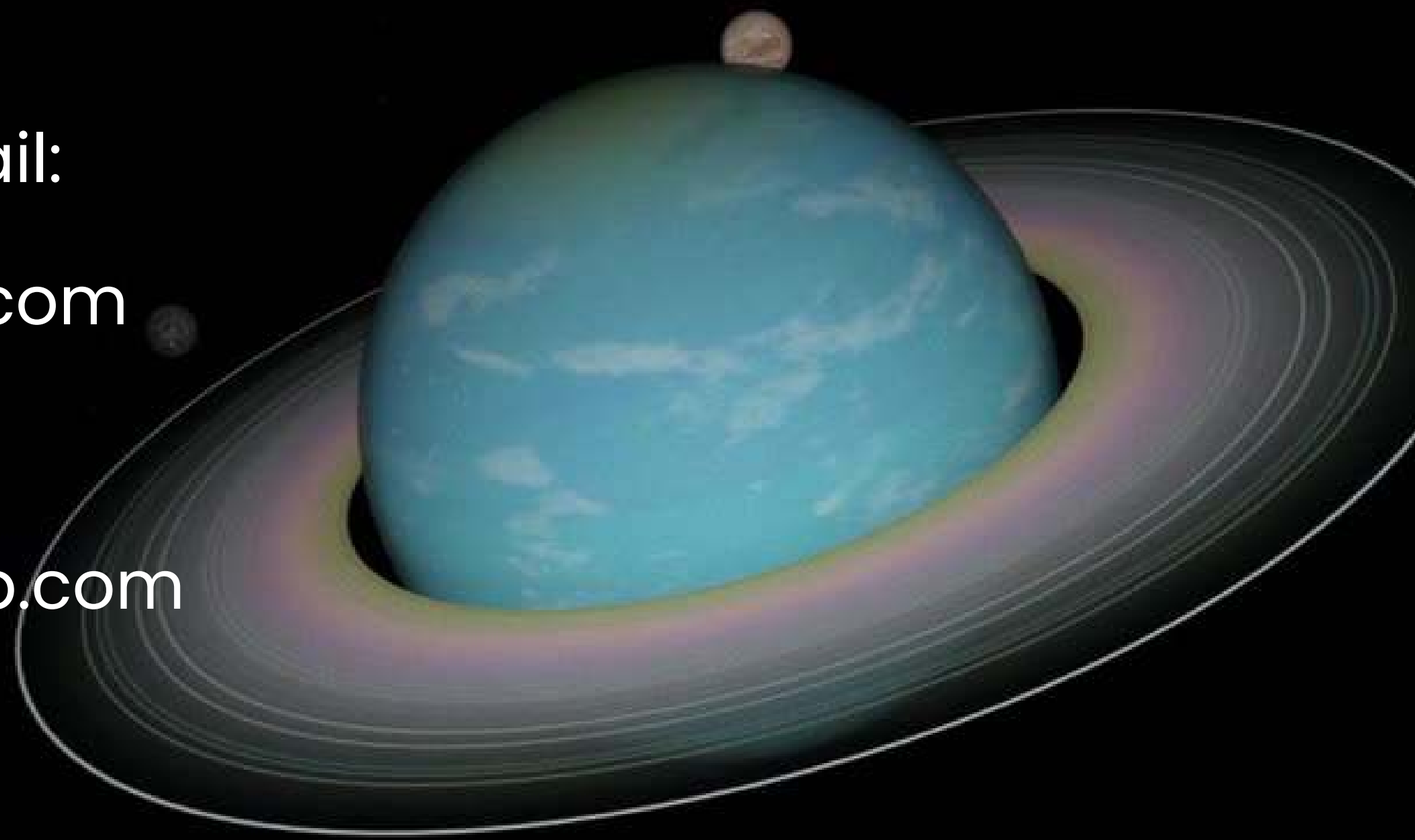
or

president@ubcastronomyclub.com

or visit our website:

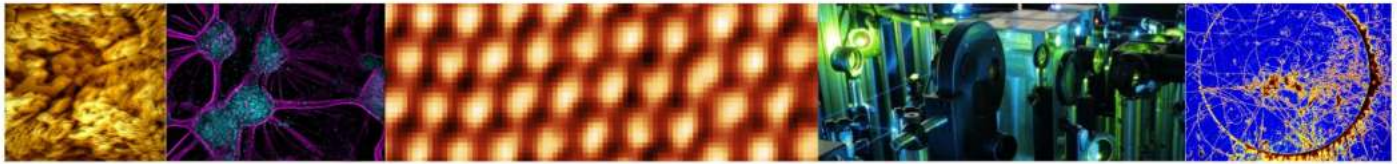
www.ubcastronomyclub.com

@ubcastronomyclub



BIOPHYSICS & MEDICAL PHYSICS SOCIETY

UBC BPMPSS



Get Connected!

Community

- Connect with other students who are interested in the field
- Social events → bouldering, intramural teams, trivia night, study groups, board game night, etc.

First event of the 2025 fall term:

Lead climbing at the Aviary!

Date: Thursday, September 11th

Time: 5:00-7:00 pm

Cost: $15 for non-members

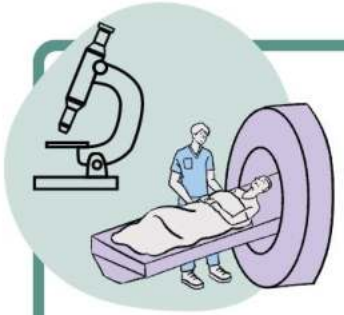
Limited spots available!

Lab Tours

- Facilitate and participate in lab tours around Vancouver
- Engage with researchers and graduate students

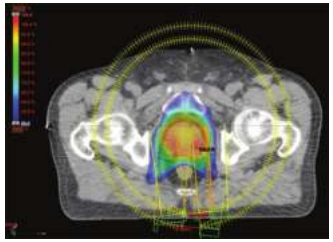
MRI/PET Tour

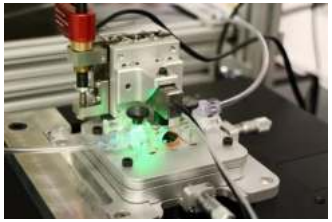
Leslie Lab Tour

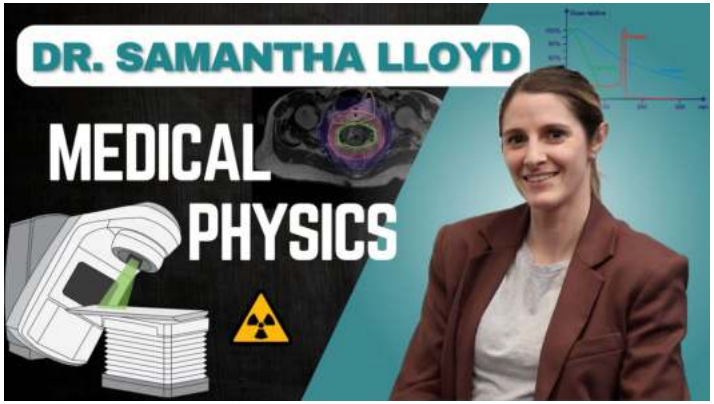


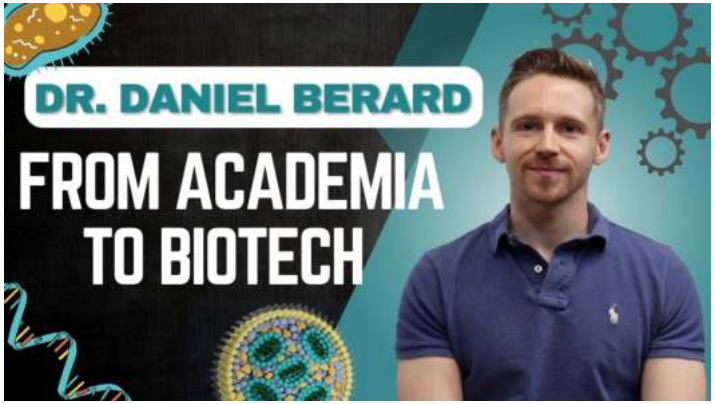
Careers & Research

- Learn about research that faculty and other students are engaged in
- Explore different career paths in the field



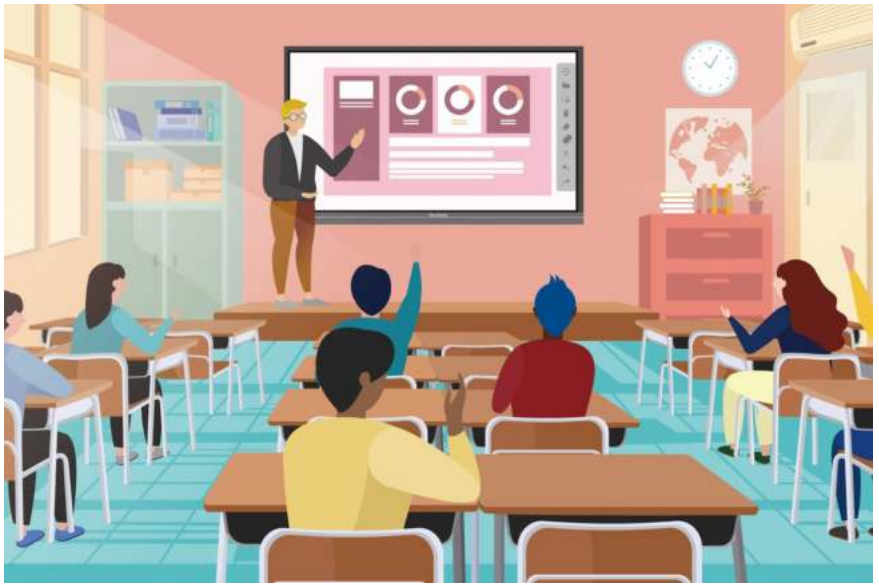






High School Outreach

- Create science demos for high school students
- Encourage students to pursue interdisciplinary fields
- Build public speaking skills and gain volunteering experience



Contact Us!

We are looking for:

- Social Media Manager
- Video Producer
- Outreach Instructors
- Lab Tour Coordinators
- Events Coordinator

Fall Meeting:

Tuesday, September 16th @ 4:00pm in HENN 318

https://blogs.ubc.ca/bpmpss/

PHAS EDI committee

Find out more!
https://equity-inclusion.phas.ubc.ca/

PHAS EDI committee

- ~12-15 members: grad and undergrad students, faculty, staff, postdocs
  - Calls for new members usually go out in the spring
- Dept climate survey and recommendations
- Annual town hall meetings

Organized into three working groups - ***all dept members (including students!) are welcome to contribute!***

Feedback on our plans is very welcome, anytime!

UBC PHAS EDI support systems working group

Update for PHAS grad students and postdocs

The UBC PHAS EDI support systems working group

Purpose: Create support systems (mentorships program, new department member orientation, outreach initiatives, scholarships and address high cost of living). Cross-link with existing groups (e.g. societies, clubs, and committees)







Support systems working group plan

- **Launchpad for Summer 2026**: offering of 5-6 summer research positions for Indigenous students. It will complement the newly introduced Indigenous Student Researchers Pathway to NSERC USRA, and it will guarantee returning students a spot the following year.
- **Admissions Cycle 2026:** implement new policies to increase applications of racialized and underrepresented groups (e.g. application fee waivers; focused marketing strategies)
- **Graduate Student Involvement**: we will advocate that the department head provides a clear set of expected outcomes and a timeline in advance for graduate student involvement in hiring committees.
- **Initiate Incident Response Contacts:** assess training paths for the designated point of contacts in the department.

2025-2026 Members

Learning and Resources Working Group

Jess McIver

Pedro Villalba González

Adele Ruosi

Ingrid Stairs

Ana Flora Felixde Souza Pontes

Jenny Zhu

Aakash Anantharaman

Michelle Kunimoto

2025-2026 Activity Plan – Workshops and Trainings

- Sexual Violence Prevention and Response Office (SVPRO) workshop, by Habibatou Ba, SVPRO Interim Director, for faculty and staff. Winter 2025.
- Neurodivergent Learners workshop by Erica Jeffrey, science education specialist in the Biology program, for faculty, staff, RAs, postdocs, graduate and undergrad students. Winter 2025
- Conflict Theatre event with Tom Scholte, UBC professor, dept of Theatre and film, for faculty, staff, RAs, postdocs and graduate students. Spring 2026.
- Supporting Students in Distress and Suicide Awareness & Intervention Training – by UBC Wellbeing for all students (grad and ug). Winter 2025.
- Support to Student-Led Workshops (e.g. preparing for application to grad school led by PHYSSOC)

2025-2026 Activity Plan - Resources

- Guidelines for students for instructors – completed by end of Summer 2025
- Orientation package for new faculty – completed by end of December 2025
- Orientation package for new staff – completed by end of Summer 2026
- Lab's accessibility - Guidelines for PHAS leadership and instructors – completed by end of Summer 2026
- [Guidelines for an inclusive course syllabus for instructors – completed by end of Summer 2026]

We’d love your input!

- Please share your feedback on the current agenda and let us know if there are workshops or resources you'd like to see offered by the department.

Interested in getting more involved? Consider joining our working group!

- We're especially inviting graduate students and post docs to help plan and implement the upcoming Conflict Theatre event. The overall time commitment is approximately 7 hours, and It’s a great opportunity to collaborate on writing a scenario for the play. If you're interested, you can also take part in the acting!

- The Lab’s Accessibility Project will also be hiring 10 undergraduate students in Science as consultants. The overall time commitment is approximately 5 hours. This is a chance to contribute valuable insights and help shape a more inclusive environment.

UBC PHAS EDI - Community Building Group




Our Mission

Fostering an inclusive and connected department for all groups: students/Postdocs/ staff/faculty




\+ Mira

Initiatives

- Weekly Tuesday Tea event
  - Opportunity to connect with others in the department
  - Meet new members
  - Status: ongoing
- Open house of various Labs
  - To encourage access to resources and skills
  - Status: organizing
- Sensory room
  - Applied for funds/awarded
  - We have a room
  - Status: planning
- Townhall
  - Engage community and recruit volunteers
  - To be planned for 2025

And ...

Continue to explore new avenues to engage and connect:

- Community lunches
- etc

Atomic, Molecular and **Optical** (AMO) Physics

Laser control of **Atoms, Molecules** and their **Quantum Interactions**

Ultra-cold atoms
Atoms in superfluid helium
Anti-atoms of antimatter

Ultra-cold molecules
Molecular super-rotors
Cold molecular plasmas

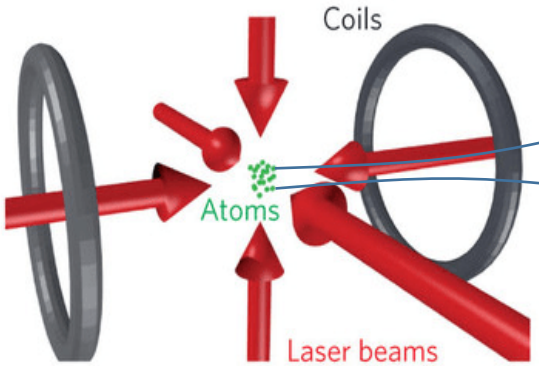
3 "AMO Nobel Prizes" in last 10 years (2023, 2022, 2018)

Frequency combs
Extreme frequencies
Optical centrifuge

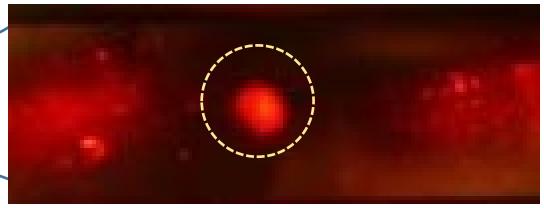
Atomic Physics

QUANTUM GASES

[Madison]

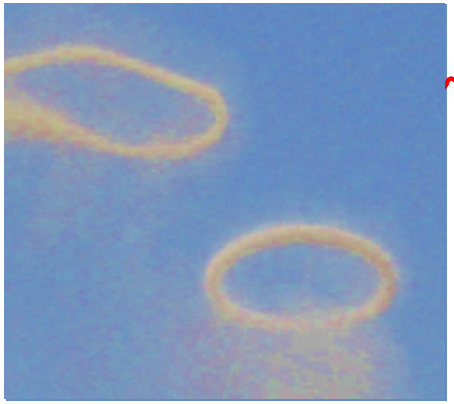


Li atoms at 500 nK



QUANTUM LIQUIDS

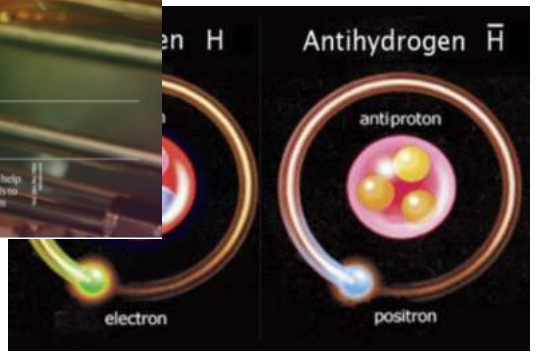
[Milner]



Roton "smoke rings"

er pulse

Antihydrogen

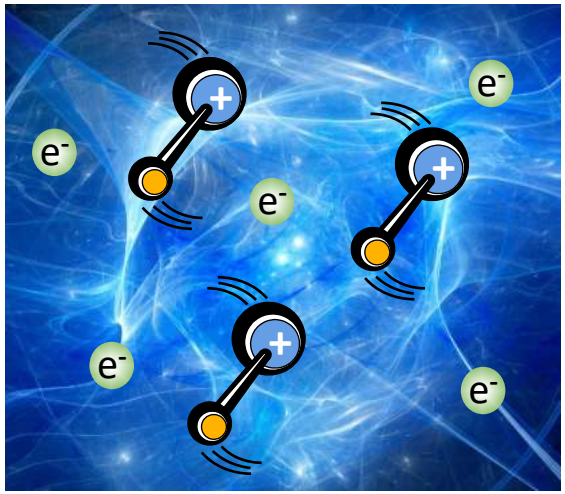


ALPHA (Antihydrogen Laser Physics Apparatus)

Molecular Physics

COLD MOLECULAR PLASMAS

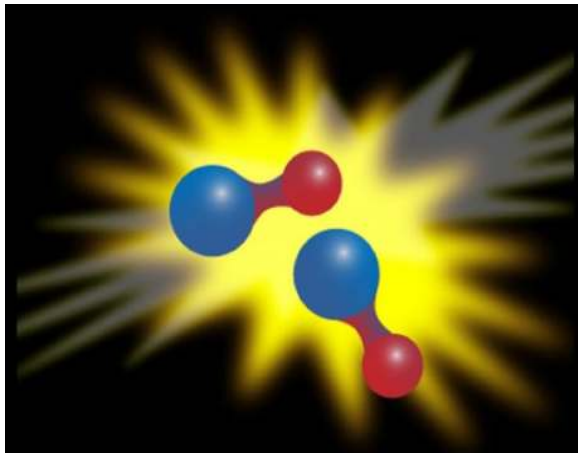
[Grant]



NO

ULTRACOLD MOLECULES

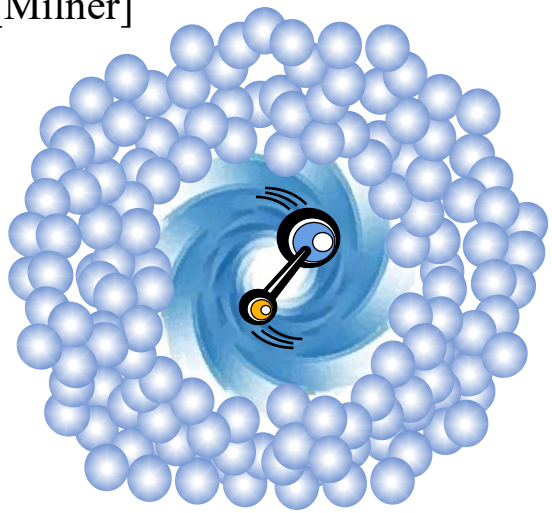
[Madison]



LiRb

MOLECULAR SUPER-ROTORS

[Milner]

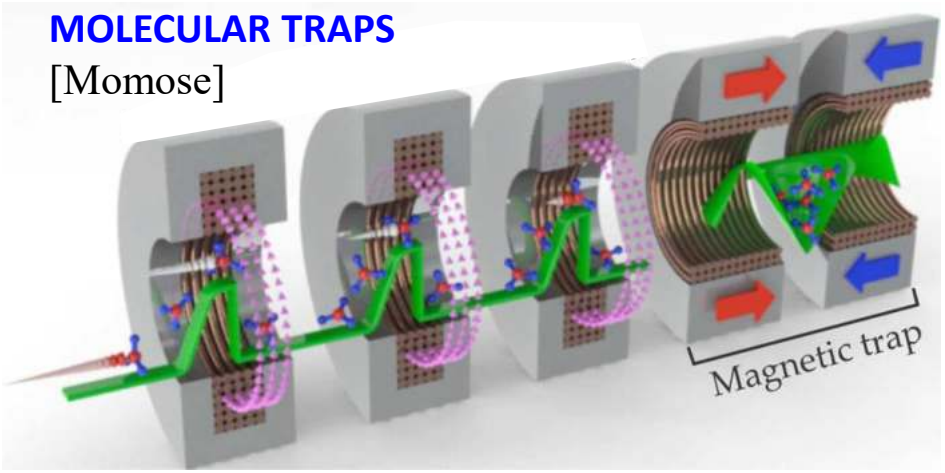


He_2

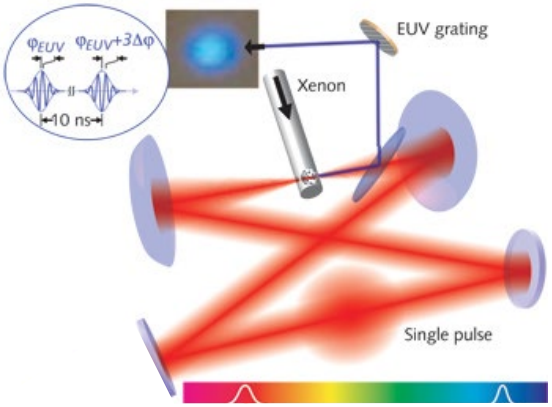
CH_3

MOLECULAR TRAPS

[Momose]

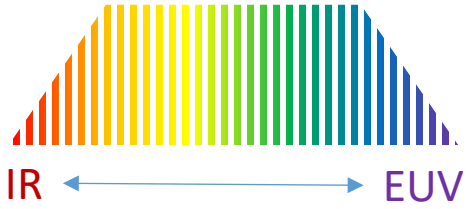


Optical Physics



FREQUENCY COMBS

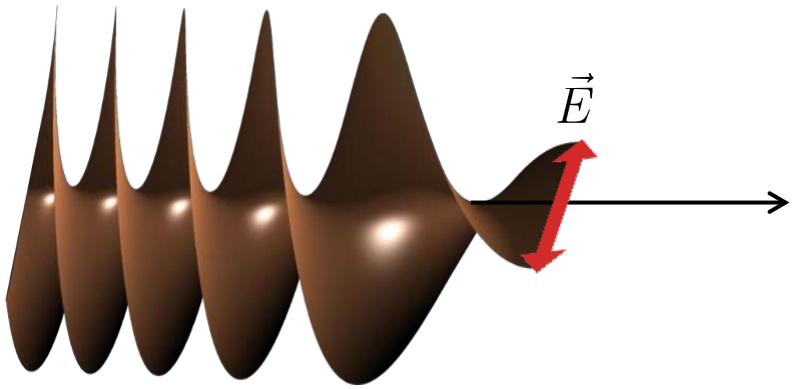
[Jones]

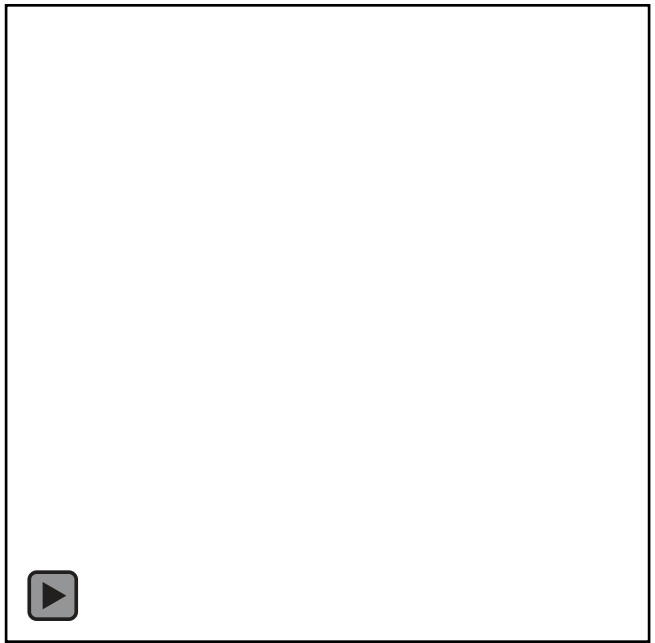


Atto-second pulses
Extreme frequencies

OPTICAL CENTRIFUGE

[Milner]





Two Centers for **AMO** Physics at UBC

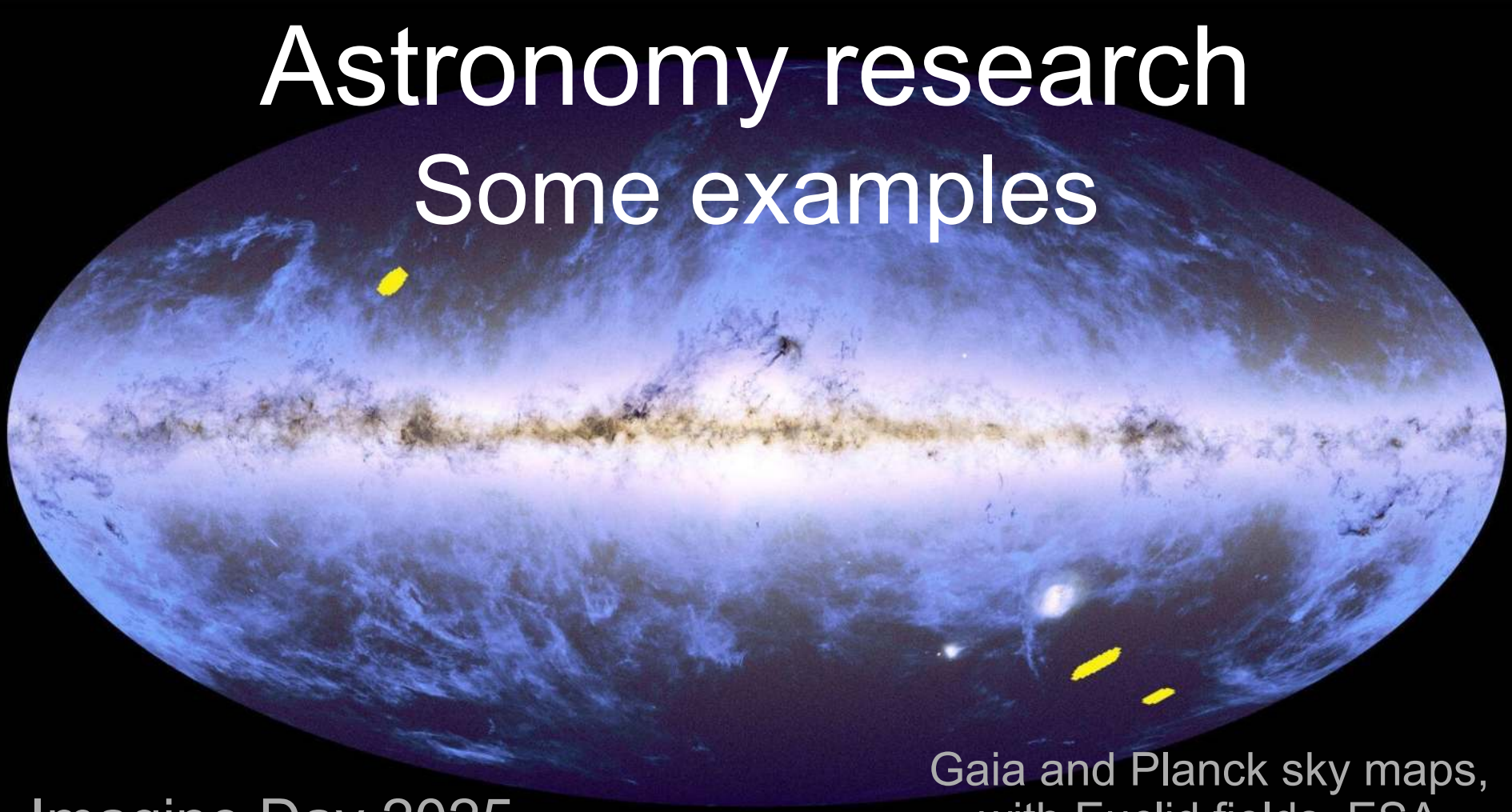
CRUCS — Canadian Centre for Research on Ultra-Cold Systems

CHIROS — Chirality Research on Origins and Separation

Chirality Reseacrh On Origins and Separation

AMO @ UBC	Department of **PHYSICS**	Department of **CHEMISTRY**
EXPERIMENTAL STUDIES	David Jones Kirk Madison Valery Milner Ziliang Ye	Keng Chou Edward Grant Takamasa Momose
THEORETICAL STUDIES	Mona Berciu Andrew Potter Fei Zhou	Roman Krems

Astronomy research
Some examples



Gaia and Planck sky maps, with Euclid fields. ESA

Imagine Day 2025

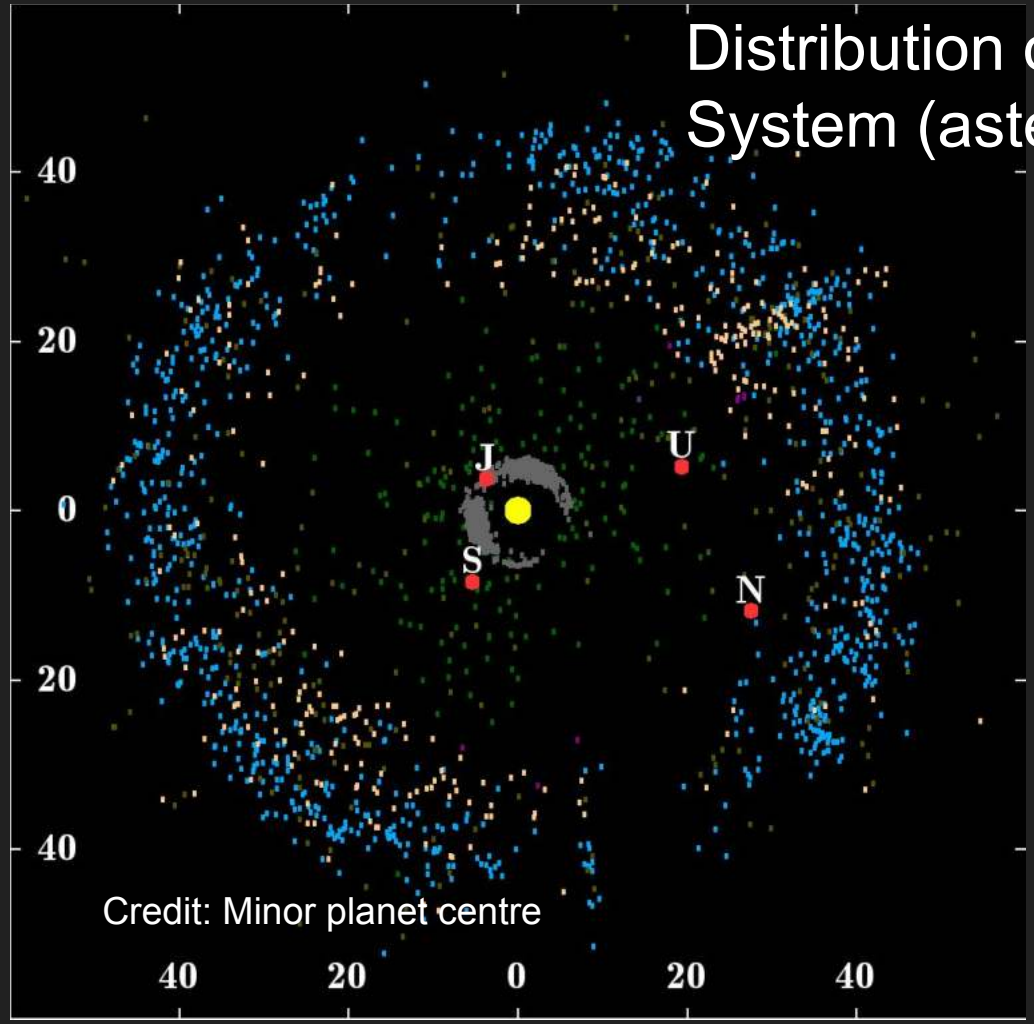
At UBC, we cover the full range of astronomical scales, from planetary science to cosmology

We have observers, experimentalists, modellers, theorists and those who do some of each

If you're interested in any particular type of astronomy, let us know to find out about possible research opportunities

What are some of the big questions UBC astronomers are addressing?

Distribution of small bodies in the Solar System (asteroids and small icy bodies)



Credit: Minor planet centre

What was the formation history and evolution of the Solar System?

What can small bodies and meteorites tell us about that history?

Image of the meteorite Allende (Wikimedia)

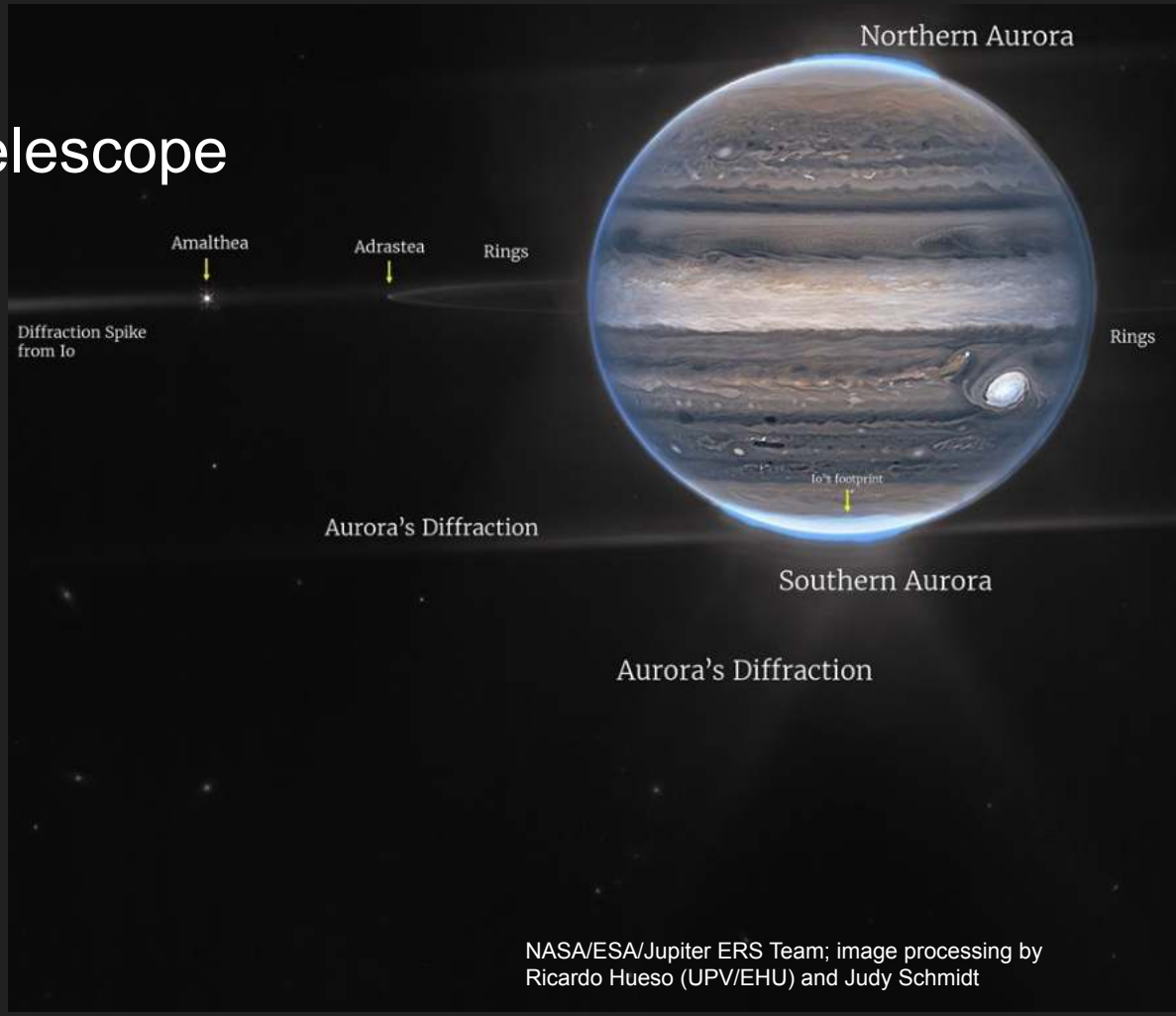
Jupiter
as seen by the Webb Telescope

How do planets form?

How do the building blocks of planets form?

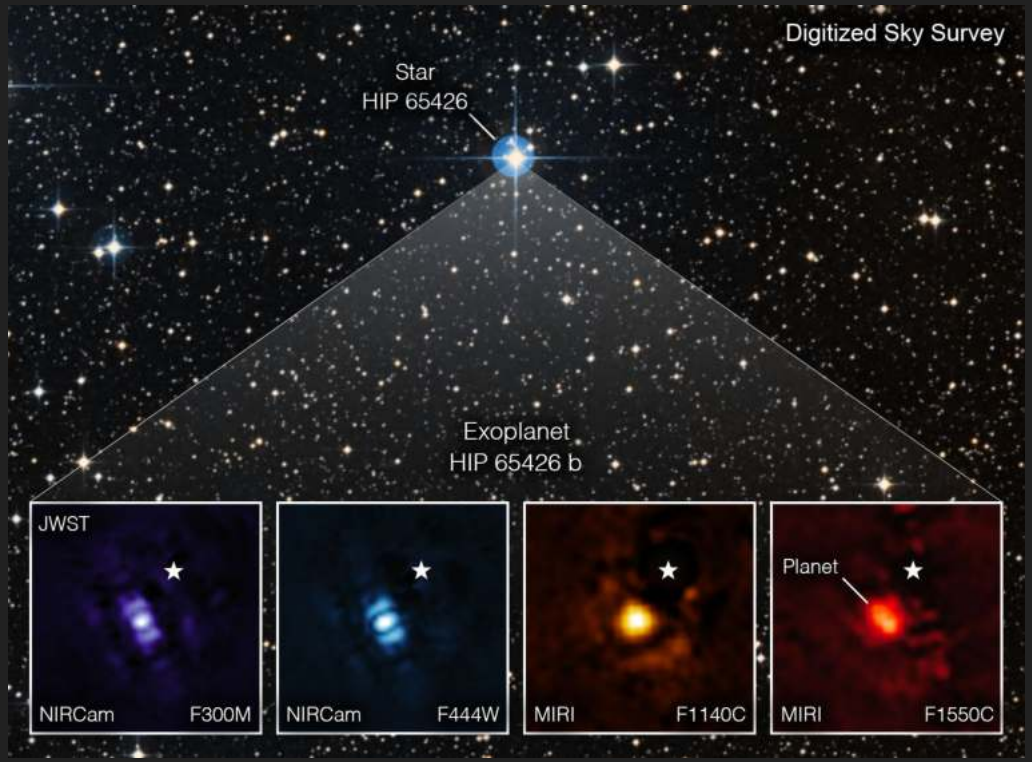
What processes set planetary architectures?

How do planetary systems evolve?



NASA/ESA/Jupiter ERS Team; image processing by Ricardo Hueso (UPV/EHU) and Judy Schmidt

Directly imaged planet HIP 65426 b as see by the Webb Telescope



Credit: NASA/ESA/CSA, A Carter (UCSC), the ERS 1386 team, and A. Pagan (STScI).

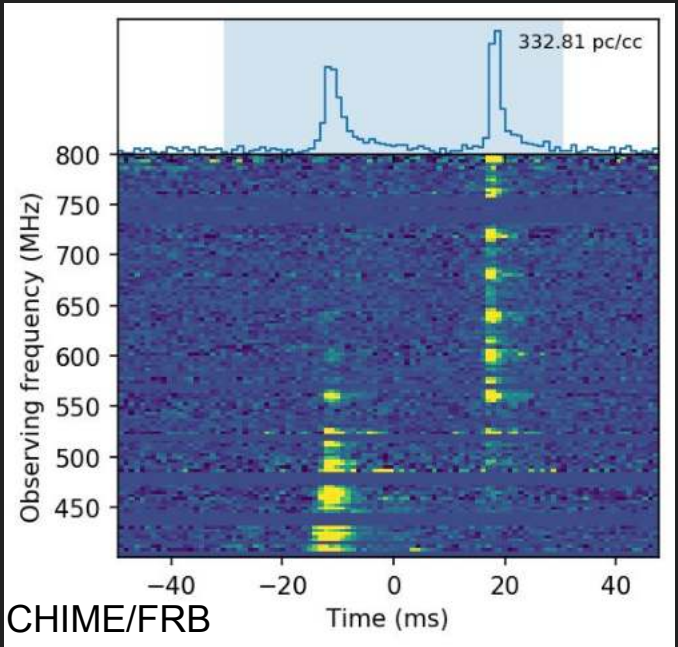
What can exoplanets tell us about the possibilities for life elsewhere in the Universe?

What are the connections between star and planet formation?

CHIME/FRB and Pulsar Timing Arrays

What are the extreme physical conditions in compact objects and do they show a need for extensions to standard physics?

What can compact objects tell us about gravity and gravitational waves?



CHIME/FRB

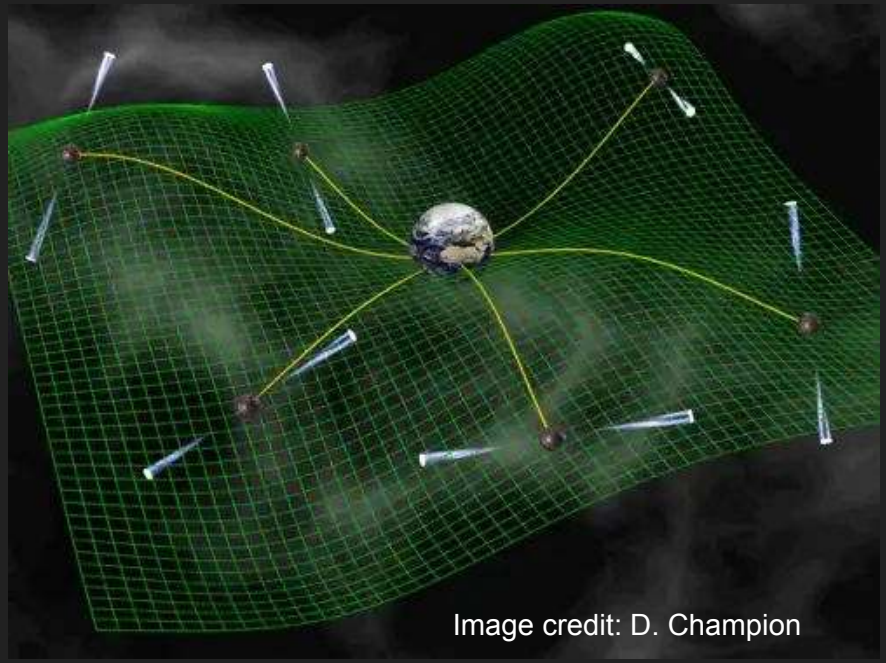
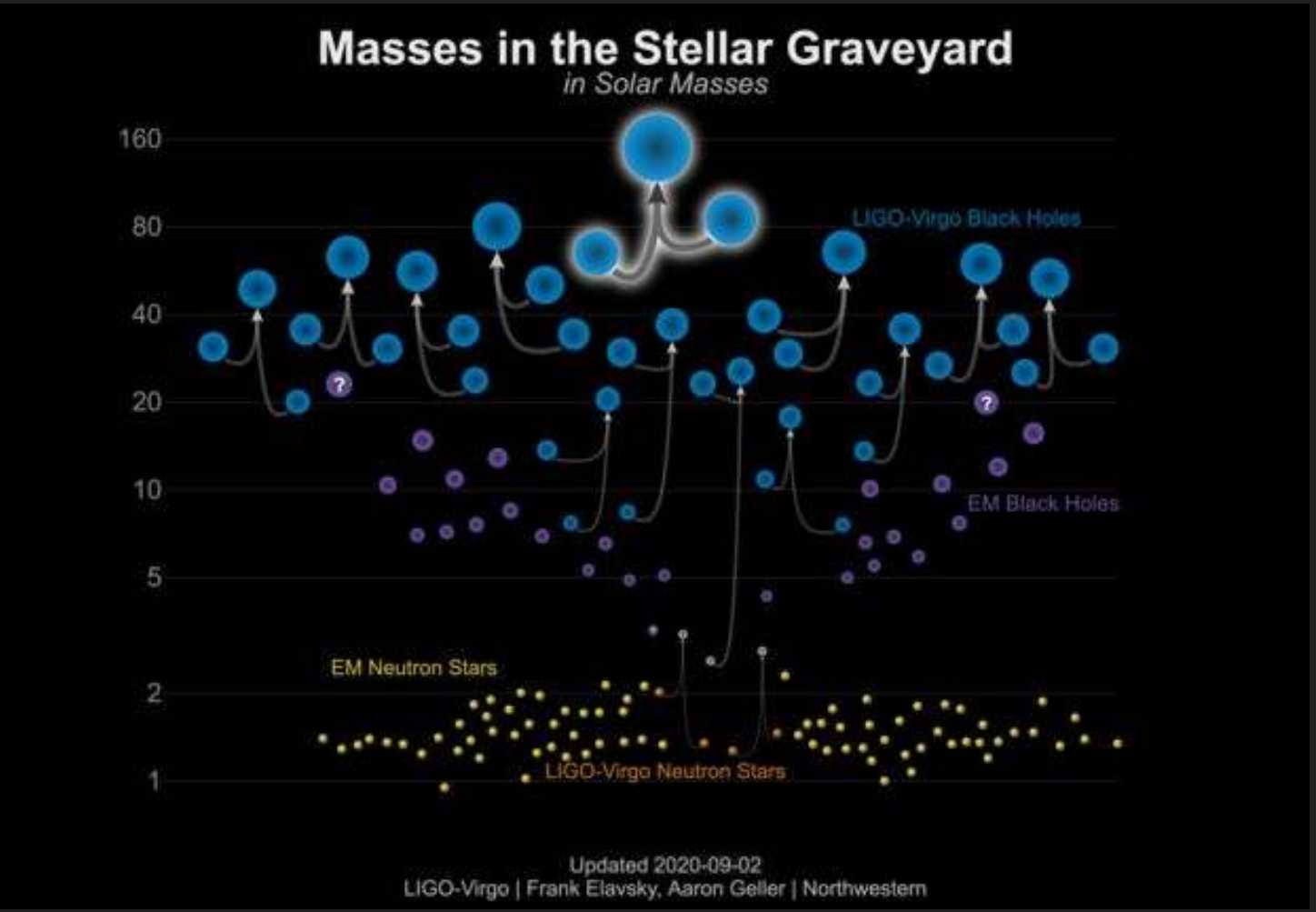


Image credit: D. Champion



What are the mass ranges of black holes?

What are the merger rates of black holes and compact objects?

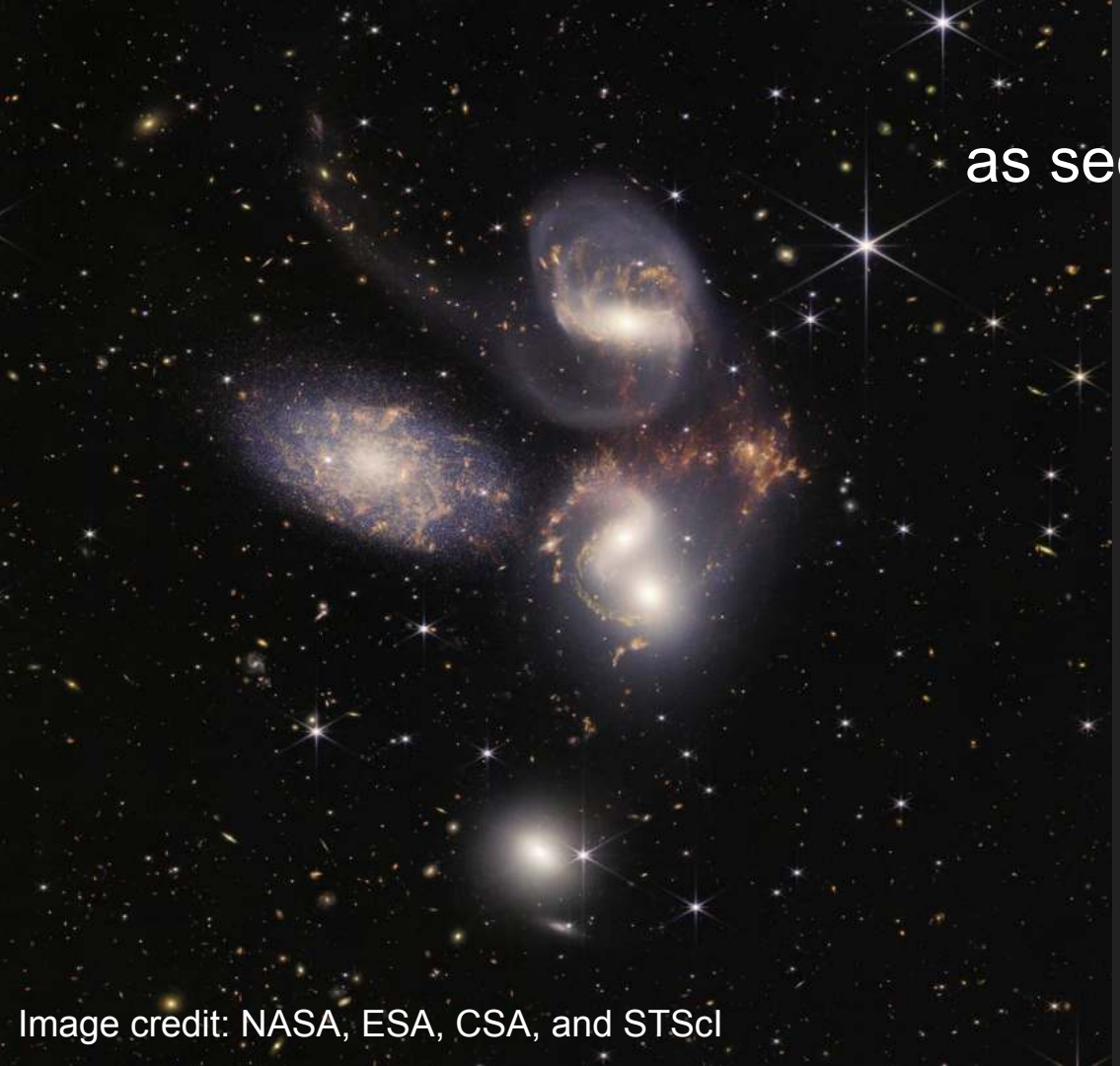


Image credit: NASA, ESA, CSA, and STScI

“Stephan’s Quintet”
as seen by the Webb Telescope

How do galaxy interactions alter the gas and stars in galaxies?

How are galaxies influenced by their large-scale environment in which they reside?

Galaxy cluster SMACS 0723
as seen by the Webb Telescope

When did the first galaxies form?

What reionized the Universe - massive stars or supermassive black holes? Something else?

What was the evolution of the early Universe?

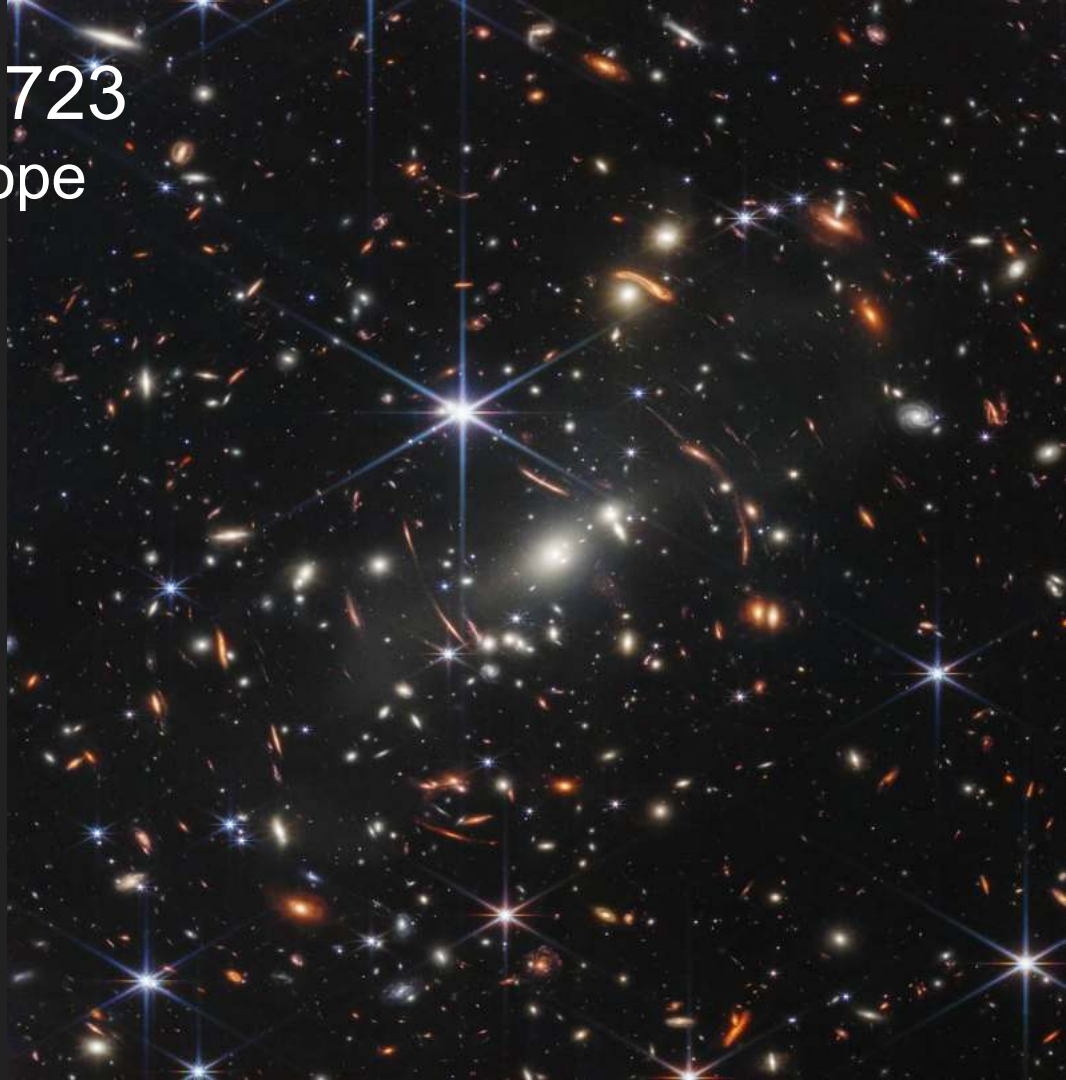


Image credit: NASA, ESA, CSA, and STScI

Cosmology – Origin and Evolution of the Universe

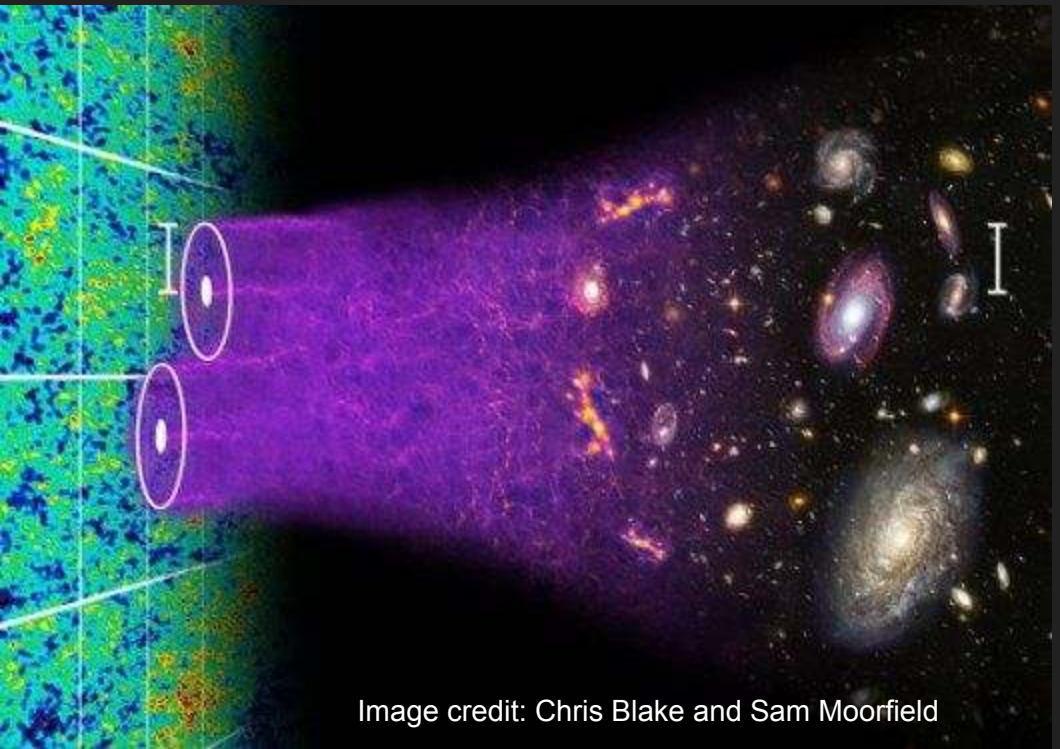


Image credit: Chris Blake and Sam Moorfield

What are the precise values of the numbers that describe our Cosmos?

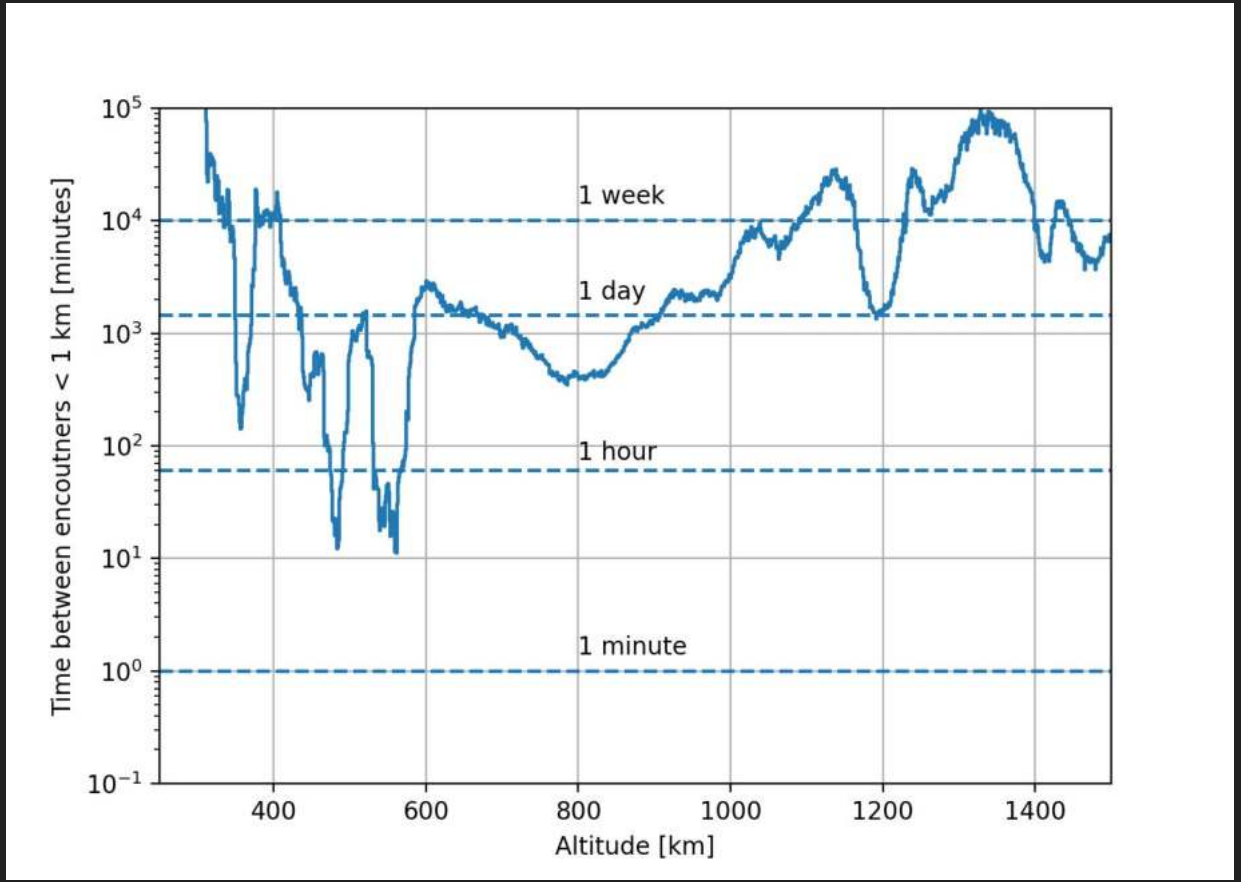
What is Dark Matter and what is Dark Energy?

What physics are we missing?

Space Sustainability and Science-Policy

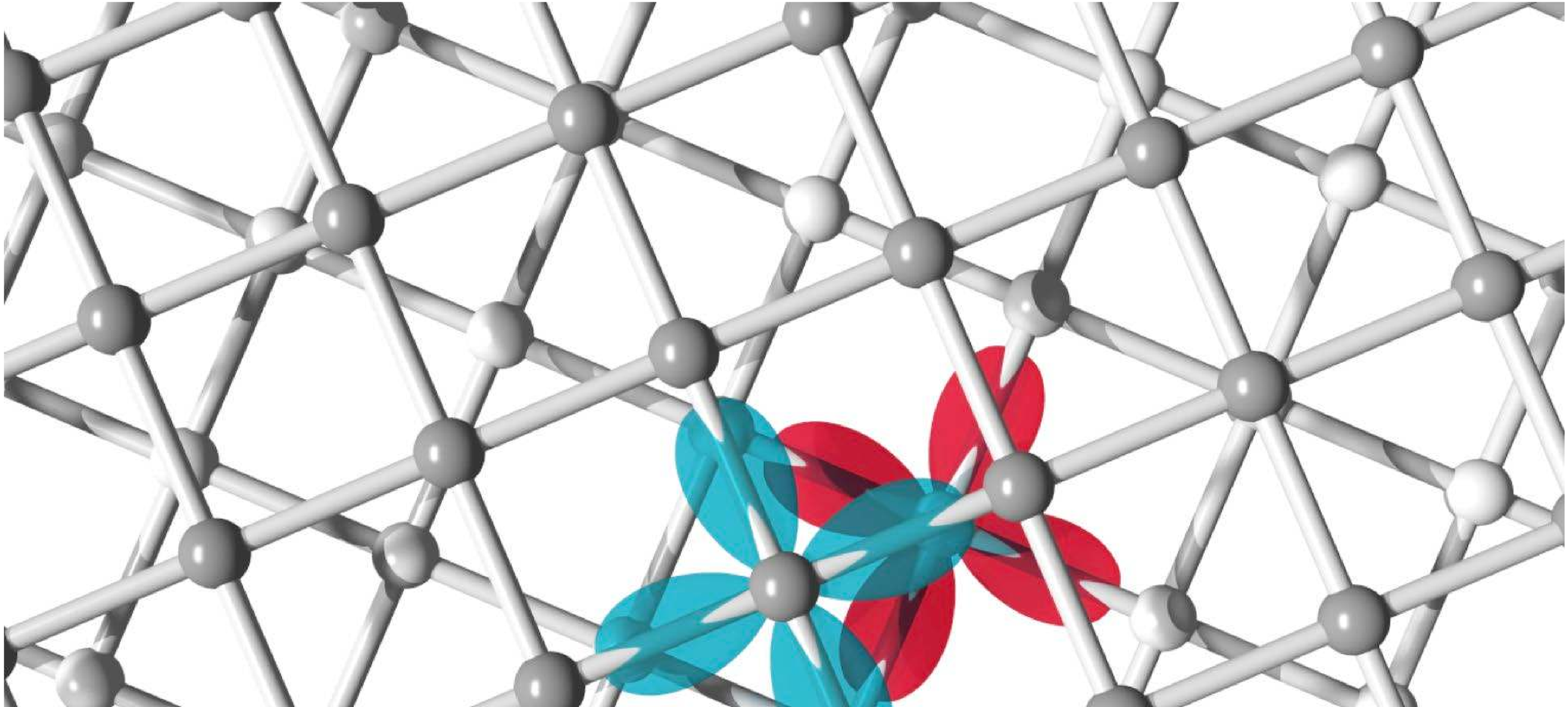
How do we develop space while protecting the Earth-space environment?

How do we avoid conflict in space?

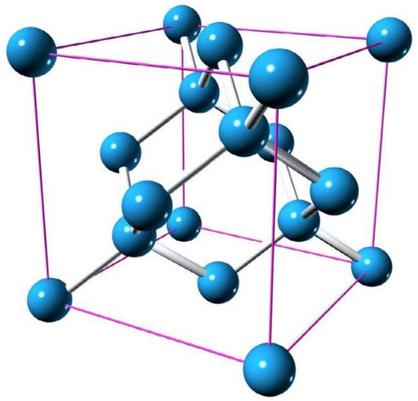


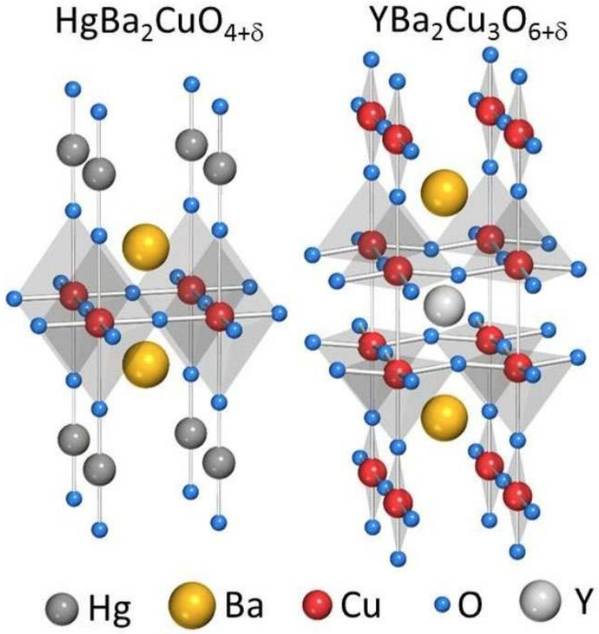
Condensed matter physics

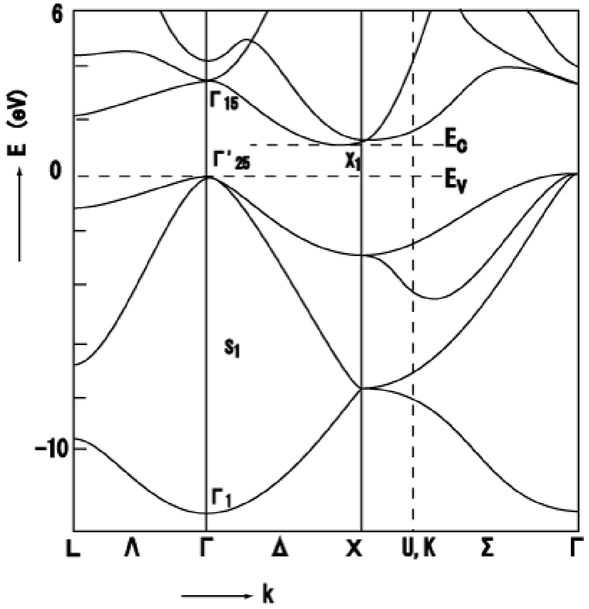
at UBC and more generally



Electron motion is crystal lattices



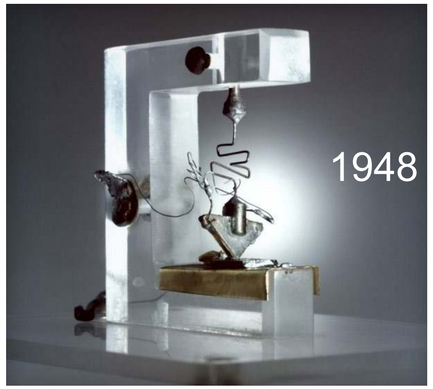


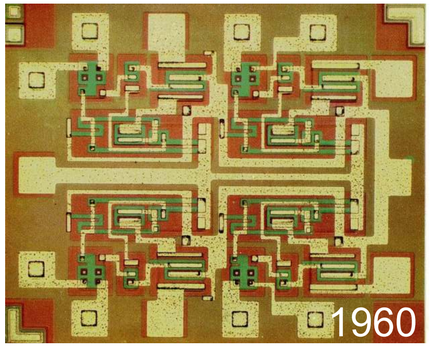


Understanding:
“band theory of solids”
1929

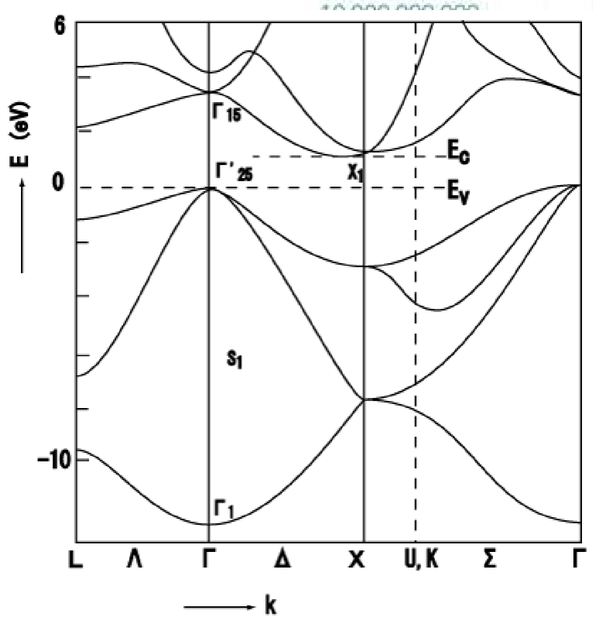
Invention of transistor 1948

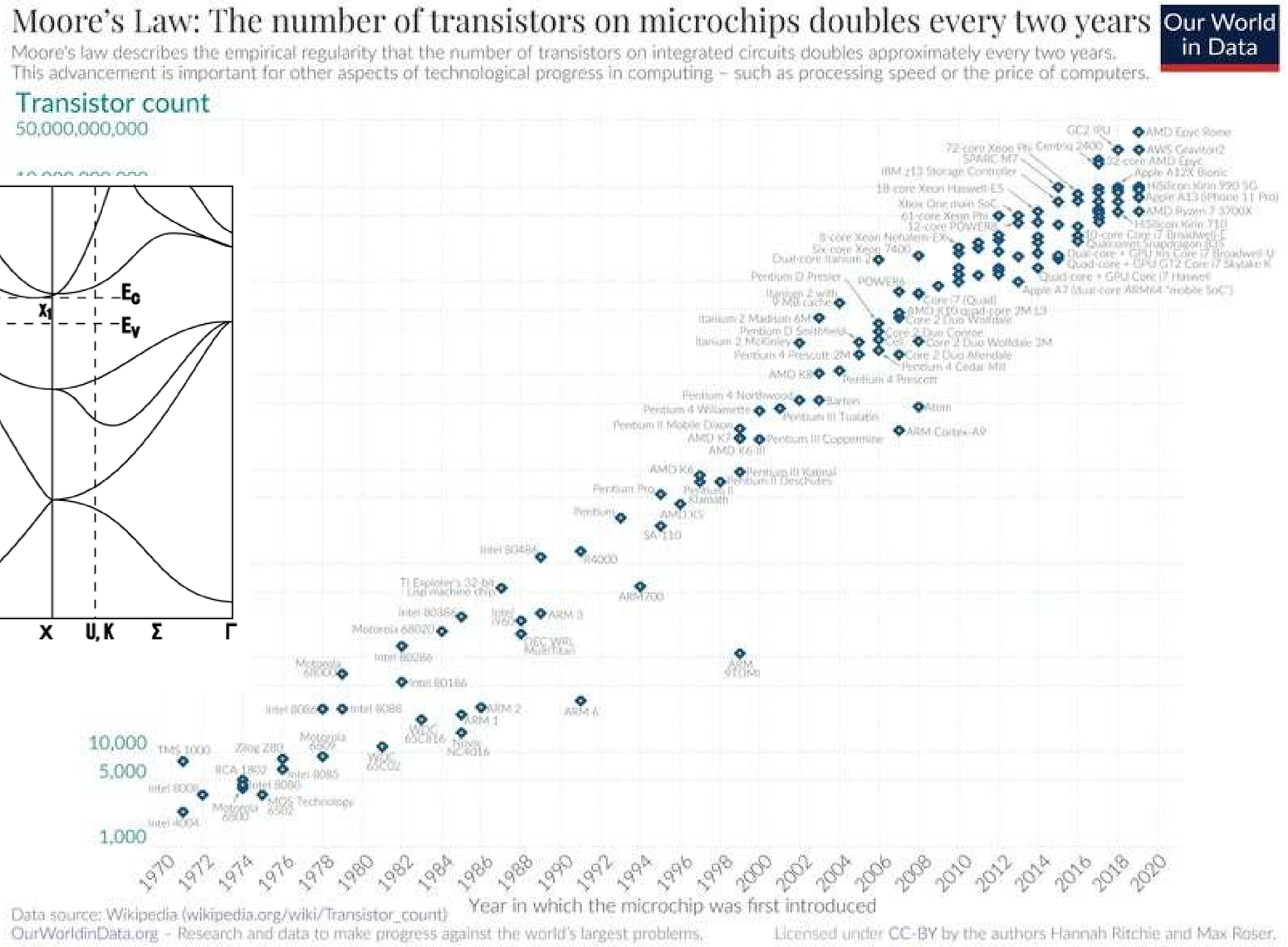
Transistor: The most influential invention in history?



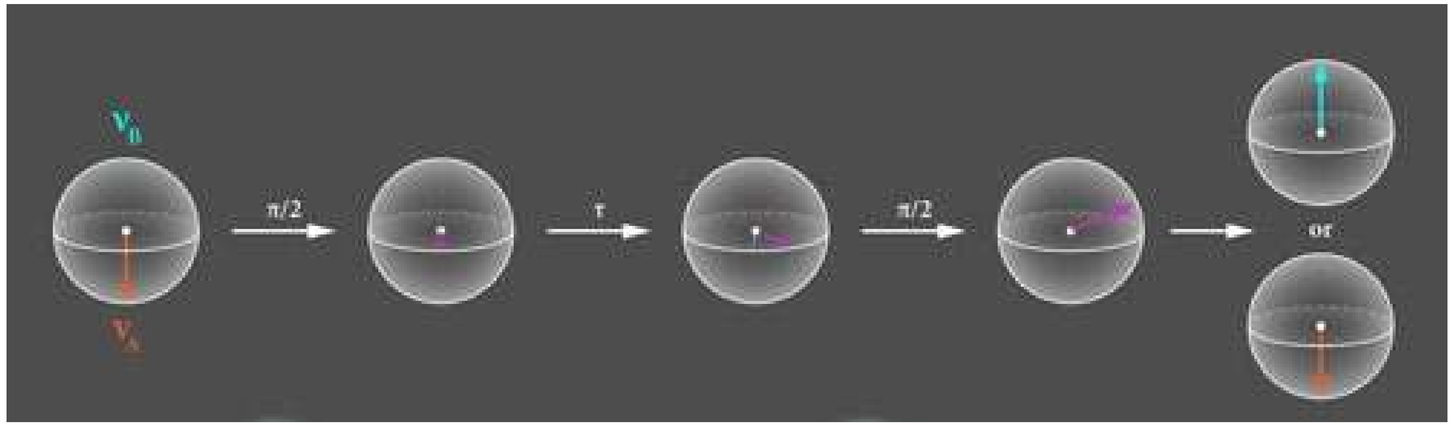


Today it is estimated that 30 trillion transistors are produced every second!

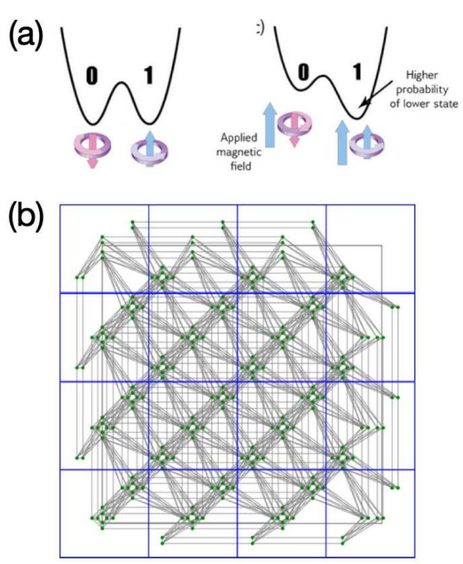


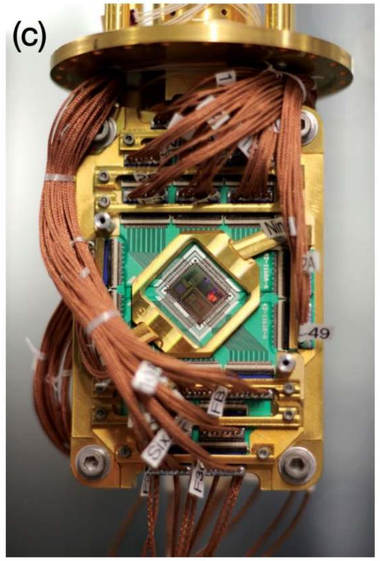


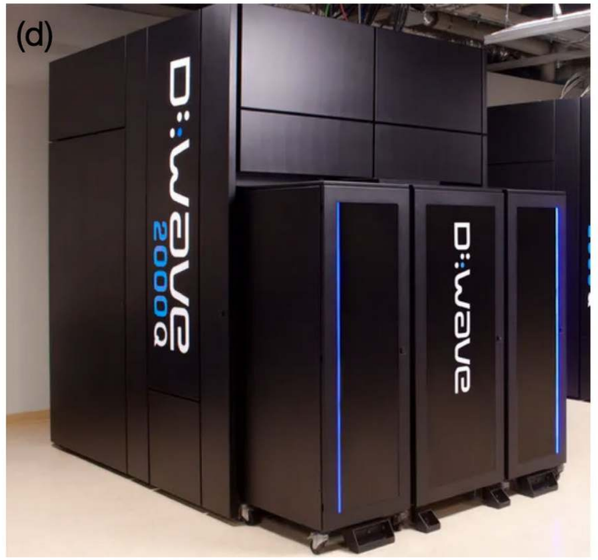
Quantum computing: The coming revolution



By exploiting the laws of quantum mechanics directly quantum computers are in theory capable of solving classically intractable computational problems.







SBQMI Overview

Andrea Damascelli
Scientific Director

Marcel Franz
Deputy Scientific Director

Paola Baca
Executive Director

Stewart Blusson
Quantum Matter Institute
THE UNIVERSITY OF BRITISH COLUMBIA

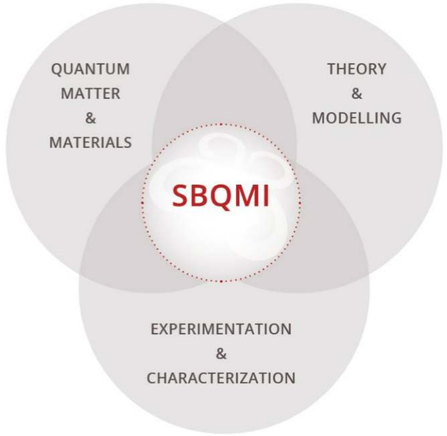
VISION

Quantum Materials by Design

Creating the building blocks for future technologies that will transform the world

Vision

Become the world leading institute in quantum materials & devices, and nucleate an ecosystem of companies for future technologies



Research **Training** **Translation**

• Physics • Chemistry • Electrical Engineering •













Joerg Rottler





New Faculty
2017/18




New Faculty
2018/19

CONTINUED UBC SUPPORT & COMMITMENT

Major new funding CFREF

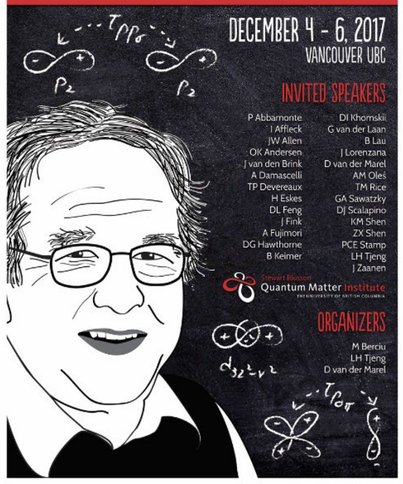
May 2017

- New building – expanded facilities/capabilities
- Infrastructure support
- 7 new faculty positions (for a total of 24)
- Student & PDF fellowships
- International opportunities and engagement

ELECTRONIC PROPERTIES OF STRONGLY CORRELATED MATERIALS

and their link to physical properties

DECEMBER 4 - 6, 2017
VANCOUVER UBC



INVITED SPEAKERS

P Abbamonte
I Affleck
JW Allen
OK Andersen
J van den Brink
A Damascelli
TP Devereaux
H Eskes
DL Feng
J Fink
A Fujimori
DG Hawthorne
B Keimer
DI Khomskii
G van der Laan
B Lau
J Lorenzana
D van der Marel
AM Oleś
TM Rice
GA Sawatzky
DJ Scalapino
KM Shen
ZX Shen
PCE Stamp
LH Tjeng
J Zaanen

Stewart Blusson Quantum Matter Institute

ORGANIZERS

M Berciu
LH Tjeng
D van der Marel

ULTRAFAST

QUANTUM CONTROL OF MATTER

THE PATH TO SOLIDS

SCHOOL 11-12 Dec. 2017
Vancouver UBC

BRAINSTORMING 13-15 Dec. 2017
Vancouver UBC

LECTURERS

Paul Brumer, *University of Toronto, Canada*
Theory of ensemble control: from atoms to nanoscale systems
Steve Cundiff, *University of Michigan, USA*
Techniques of multidimensional spectroscopy
Claudio Giannetti, *Universita Cattolica, Italy*
Ultrafast equilibrium spectroscopy of correlated materials
Lex Kemper, *North Carolina University, USA*
What can we learn from time-resolved experiments?
John Sipe, *University of Toronto, Canada*
Coherent control in many-body systems

INVITED SPEAKERS

Peter Armitage, *Johns Hopkins University, USA*
Alan Bristow, *West Virginia University, USA*
Massimo Capone, *SISSA Trieste, Italy*
Paul Corkum, *University of Ottawa, Canada*
Steve Cundiff, *University of Michigan, USA*
Tom Devereaux, *Stanford University, USA*
David Jones, *UBC, Canada*
Stefan Kaiser, *MPI Stuttgart, Germany*
Francois Legare, *INRS, Canada*
Alfred Leitenstorfer, *University of Konstanz, Germany*
Stephen Leone, *UC Berkeley, USA*
Roberto Merlin, *University of Michigan, USA*
Shaul Mukamel, *UC Irvine, USA*
Hrvoje Petek, *University of Pittsburgh, USA*
John Sipe, *University of Toronto, Canada*
Olga Smirnova, *Max Born Institute, Germany*
Mark Stockman, *Georgia State University, USA*

ORGANIZERS

Paul Corkum (Ottawa)
Andrea Damascelli (UBC)
Claudio Giannetti (Brescia)
David Jones (UBC)
Francois Légaré (INRS)

Stewart Blusson Quantum Matter Institute
THE UNIVERSITY OF BRITISH COLUMBIA

30 Years of AKLT

Interacting systems in low dimensions

April 26-28, 2018
Vancouver, UBC

SPEAKERS

Ian Affleck
Mohammad Amin
Collin Broholm
John Candy
Jean-Sebastien Caux
Claudio Chamon
Sebastian Eggert
Ian Garate
Domenico Giuliano
Masayuki Hagiwara
Duncan Haldane
Bertrand Halperin
Catherine Kallin
Brad Marston
Frederic Mila
Rodrigo Pereira
Dmitry Pikulin
Nathan Seiberg
Eran Sela
Pascal Simon
Jesko Sirker
Erik Sorensen
Hal Tasaki
Steven White

ORGANIZERS

Marcel Franz
Masaki Oshikawa

akltz018.qmi.ubc.ca

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NANOSCALE THERMAL TRANSPORT & HEAT LOCALIZATION

SCHOOL
August 29, 2018
UBC, *Vancouver Campus*

WORKSHOP
August 30 and 31, 2018
UBC, *Vancouver Campus*

LECTURERS

Mahmoud Hussein, *University of Colorado Boulder, USA*
Baowen Li, *University of Colorado Boulder, USA*
John Page, *University of Manitoba, Canada*

INVITED SPEAKERS

David Cahill, *University of Illinois at Urbana-Champaign, USA*
Chris Dames, *University of California, Berkeley, USA*
Sergej Flach, *Institute for Basic Science, Korea*
Mahmoud Hussein, *University of Colorado Boulder, USA*
Baowen Li, *University of Colorado Boulder, USA*
Alan McGaughey, *Carnegie Mellon University, USA*
John Page, *University of Manitoba, Canada*
Quentin Ramasse, *University of Leeds, UK*
Chris Regan, *University of California, Los Angeles, USA*
Mona Zebarjadi, *University of Virginia, USA*

ORGANIZERS

Alireza Nojeh, *University of British Columbia*
George Sawatzky, *University of British Columbia*
Joerg Rottler, *University of British Columbia*
Srikanth Phani, *University of British Columbia*

REGISTRATION

Please register at:
qmi.ubc.ca/nthl2018

Stewart Blusson Quantum Matter Institute
THE UNIVERSITY OF BRITISH COLUMBIA

PETER WALL INSTITUTE FOR ADVANCED STUDIES

Stewart Blusson Quantum Matter Institute
THE UNIVERSITY OF BRITISH COLUMBIA

SBQMI WORKSHOP ON

SYNTHETIC TOPOLOGICAL MATTER

FEBRUARY 18-20, 2019
UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER, CANADA

INVITED PARTICIPANTS:

Jason Alicea *(Caltech)*
Thomas Christensen *(MIT)*
Ashley Cook *(Berkeley)*
Chiara Daraio *(Caltech)*
Eugene Demler *(Harvard)*
Shanhui Fan *(Stanford)*
Gregory Fiete *(UT Austin)*
Romain Fleury *(EPFL)*
Michel Fruchart *(Leiden)*
Victor Galitski *(Maryland)*
Mohammad Hafezi *(JQI)*
Netanel Lindner *(Technion)*
Ivar Martin *(Los Alamos)*
Julia Meyer* *(Grenoble)*
Joel Moore *(Berkeley)*
Franco Nori *(Michigan)*
Yuval Oreg *(Weizmann)*
Sid Parameswaran *(Oxford)*
Tami Pereg-Barnea *(McGill)*
Mikael Rechtsman *(Pennsylvania)*
Mark Rudner *(Copenhagen)*
David Schuster *(Chicago)*
Eran Sela *(Tel Aviv)*
Justin Song *(Singapore)*
Jeffrey Teo *(Virginia)*
Ronny Thomale *(Würzburg)*
Norm Yao* *(Berkely)*
* TO BE CONFIRMED

ORGANIZERS:

Gil Refael *(Caltech)*
Marcel Franz *(UBC)*

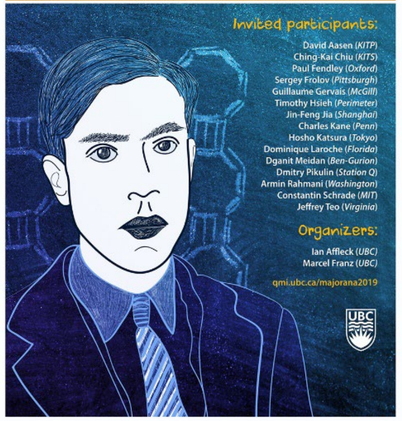
QMI.UBC.CA/TOPO2019

Stewart Blusson Quantum Matter Institute
THE UNIVERSITY OF BRITISH COLUMBIA

SbQMI brainstorming session and summer school on

INTERACTING MAJORANA FERMIONS

MAY 1 - 3, 2019, VANCOUVER BC
School: May 1 Brainstorming: May 2 and 3



Invited participants:

David Aasen *(KITP)*
Ching-Kai Chiu *(KITS)*
Paul Fendley *(Oxford)*
Sergey Frolov *(Pittsburgh)*
Guillaume Gervais *(McGill)*
Timothy Hsieh *(Perimeter)*
Jin-Feng Jia *(Shanghai)*
Charles Kane *(Penn)*
Hosho Katsura *(Tokyo)*
Dominique Laroche *(Florida)*
Dganit Meidan *(Ben-Gurion)*
Dmitry Pikulin *(Station Q)*
Armin Rahmani *(Washington)*
Constantin Schrade *(MIT)*
Jeffrey Teo *(Virginia)*

Organizers:

Ian Affleck *(UBC)*
Marcel Franz *(UBC)*

qmi.ubc.ca/majorana2019

NEW FRONTIERS

IN QUANTUM MATERIALS RESEARCH

October 3 - 4, 2019
QMI, UBC, VANCOUVER

RICE | RCQM Rice Center for Quantum Materials

Stewart Blusson Quantum Matter Institute
THE UNIVERSITY OF BRITISH COLUMBIA

RICE SPEAKERS

Pulickel Ajayan
Pengcheng Dai
Rui-Rui Du
Sarah Grefe
Randy Hulet
Alex Kutana
Andriy Nevidomskyy
Qimiao Si
Boris Yakobson
Ming Yi

UBC SPEAKERS

Meigan Aronson
Mona Berciu
Doug Bonn
Andrea Damascelli
Joshua Folk
Alannah Hallas
Alireza Nojeh
George Sawatzky
Ziliang Ye
Ke Zou

ORGANIZERS

Qimiao Si (Rice University)
Andrea Damascelli (UBC)

nfqmr2019.qmi.ubc.ca

GORDON AND BETTY MOORE FOUNDATION

UBC

QUANTUM PATHWAYS

Stewart Blusson Quantum Matter Institute

The Stewart Blusson Quantum Matter Institute at the University of British Columbia is offering multi-year summer research scholarships to students from groups that are under-represented in the physical sciences and engineering. The Quantum Pathways program provides up to 4 years of research experience to undergraduate students interested in the field of quantum materials and includes:

SCHOLARSHIPS TO SUPPORT A SEQUENCE OF UP TO FOUR 16-WEEK SUMMER RESEARCH EXPERIENCES
POSITIONS AVAILABLE TO FIRST-YEAR AND SECOND-YEAR UNDERGRADUATE STUDENTS
ONE-ON-ONE MENTORING IN RESEARCH, WRITING, AND PUBLIC PRESENTATIONS
WORKSHOPS AND COURSES TO DEVELOP RESEARCH AND PROFESSIONAL SKILLS
OPPORTUNITIES TO WORK WITH OUR PARTNER INSTITUTIONS
TRAVEL ALLOWANCE TO COME TO UBC, FOR RESEARCH-RELATED TRIPS, AND FOR CONFERENCES

ENQUIRIES | APPLICATIONS | REFERENCE LETTERS
QUANTUMPATHWAYS@SBQMI.UBC.CA

INTERNATIONAL ACADEMIC PARTNERSHIPS

MP-UBC-UTokyo Centre for Quantum Materials

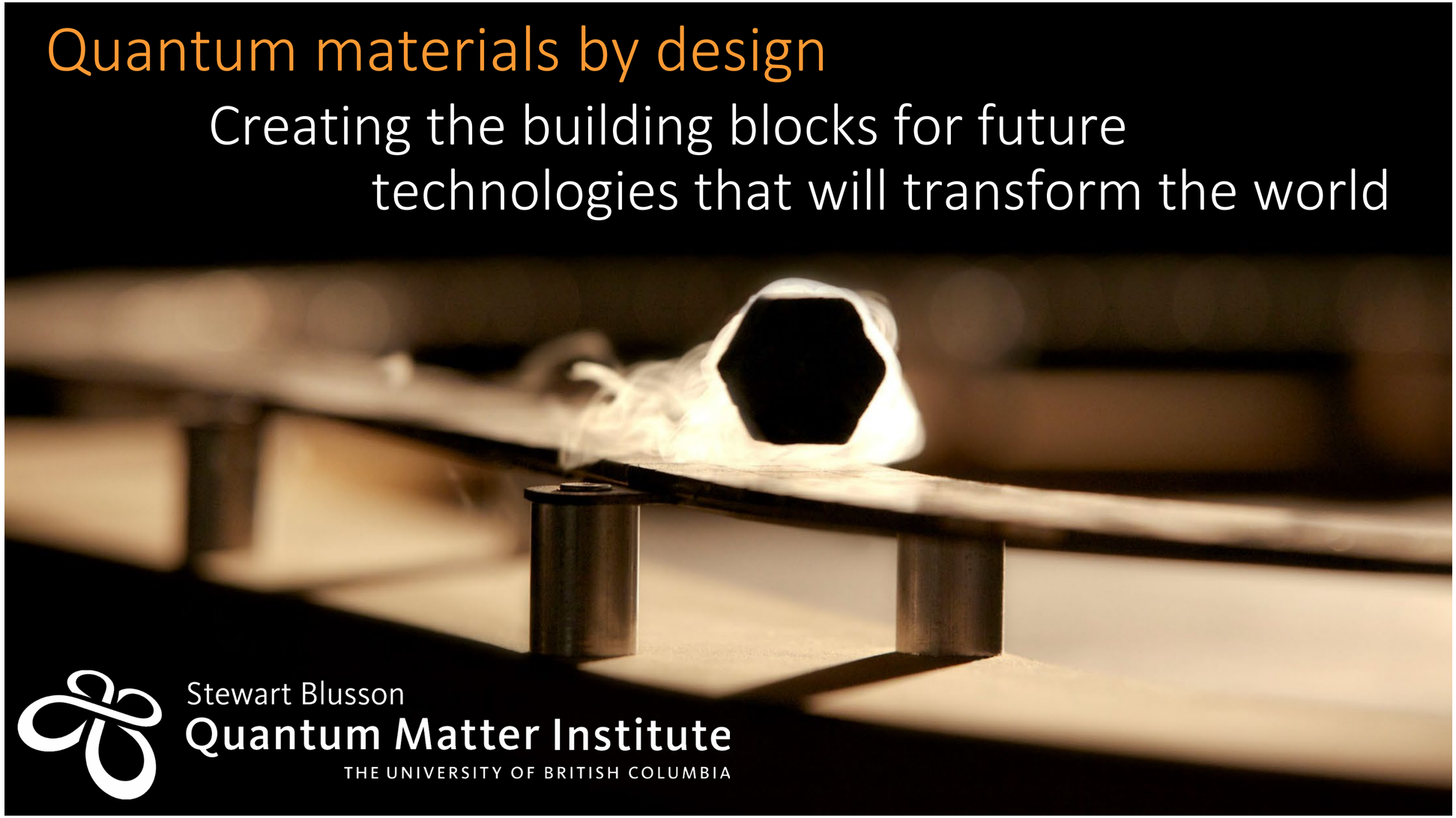
MAX PLANCK - $2.5M – UNIVERSITY OF TOKYO - $2.5m

OBJECTIVE: To promote and further the cooperation between researchers and research groups of both parties

- Student mobility agreement with University of Stuttgart
- Joint MP-UBC-Stuttgart PhD program in Quantum Materials

Quantum materials by design

Creating the building blocks for future technologies that will transform the world



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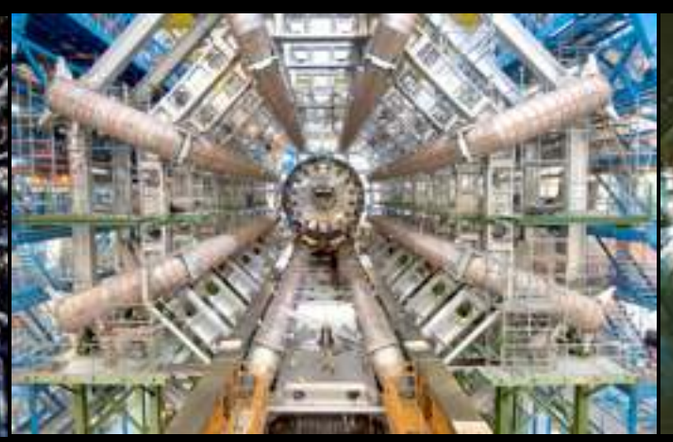
Subatomic Physics at UBC

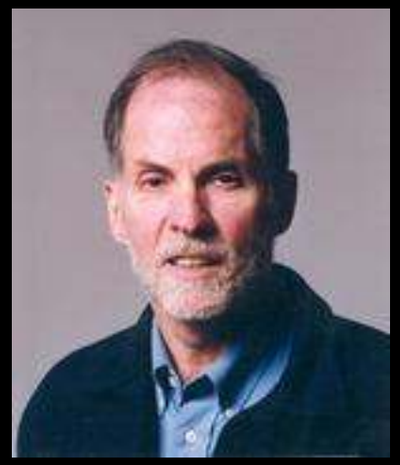
Colin Gay






Scott Oser

SuperCDMS



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DarkLight

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Kate Pachal

Colin Gay

ATLAS

Max Świątłowski

Chris Hearty

Belle II

Oliver Stelzer-Chilton

NA62, Pioneer

Doug Bryman

Janis McKenna

Tom Mattison

TRINAT

John Behr

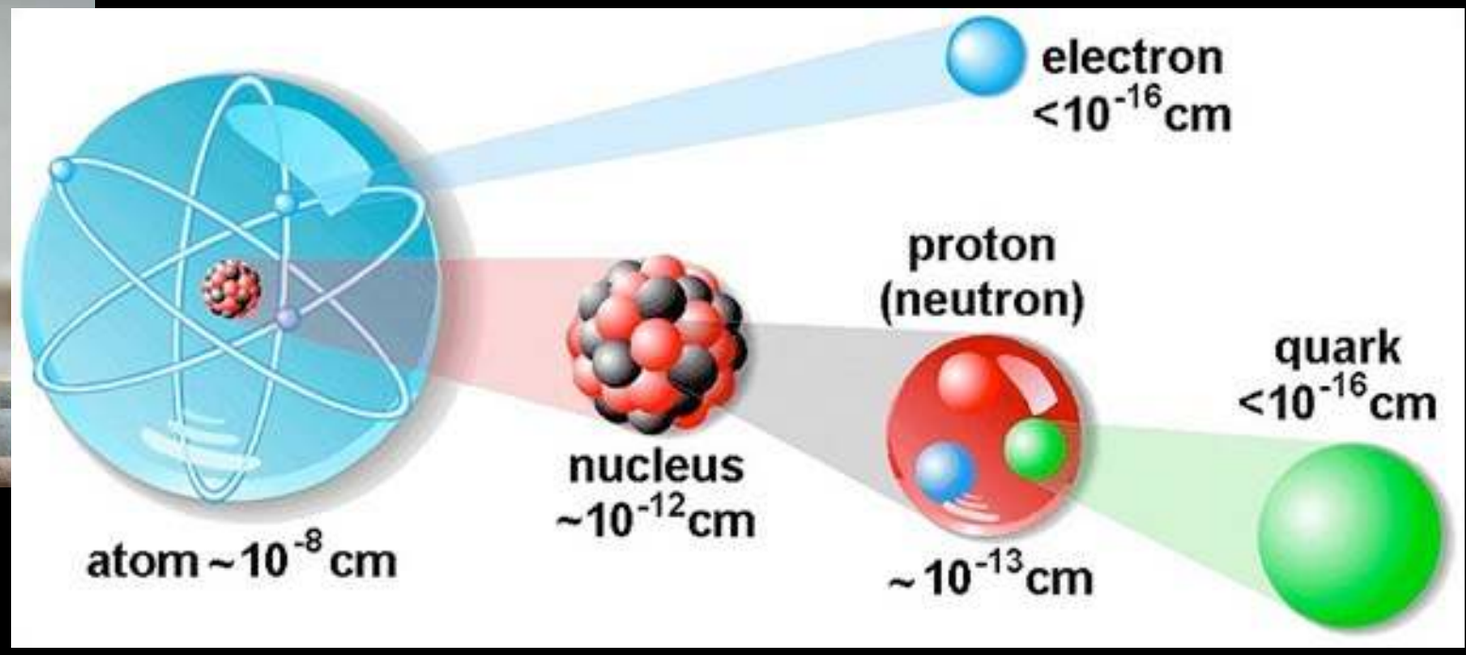
Particle (Subatomic) Physics is the prototypical reductionist field, asking the questions:

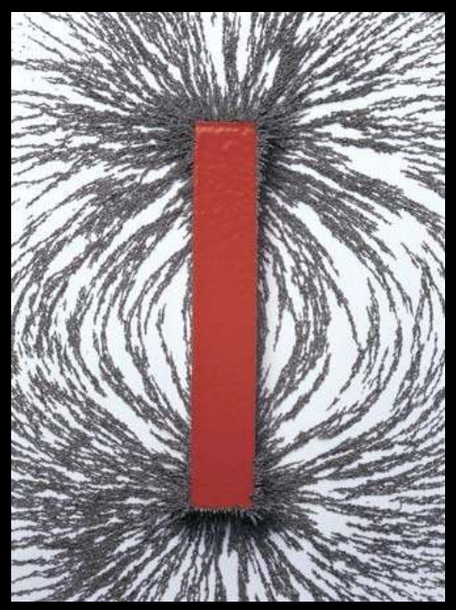
What are the indivisible building blocks of matter?

What are the fundamental forces?

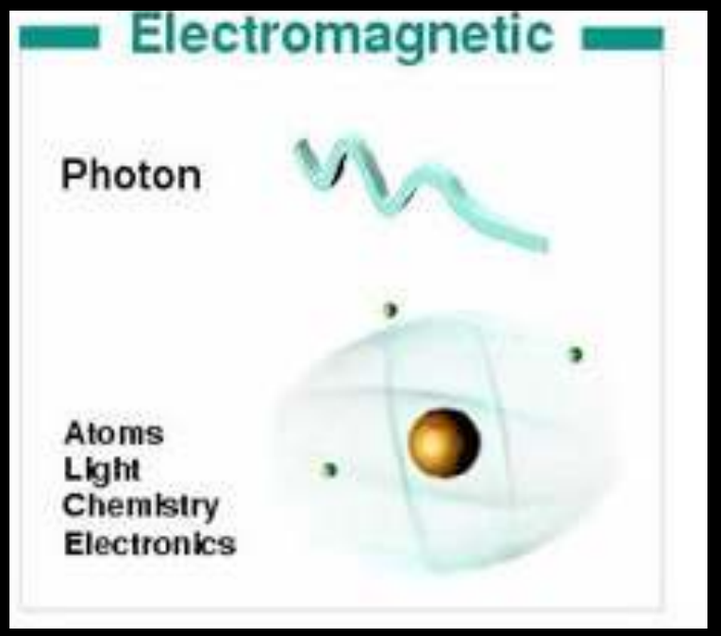
What fundamental symmetries are there?

and tries to find the most irreducible answer





= Magnetic Force
= exchanging photons



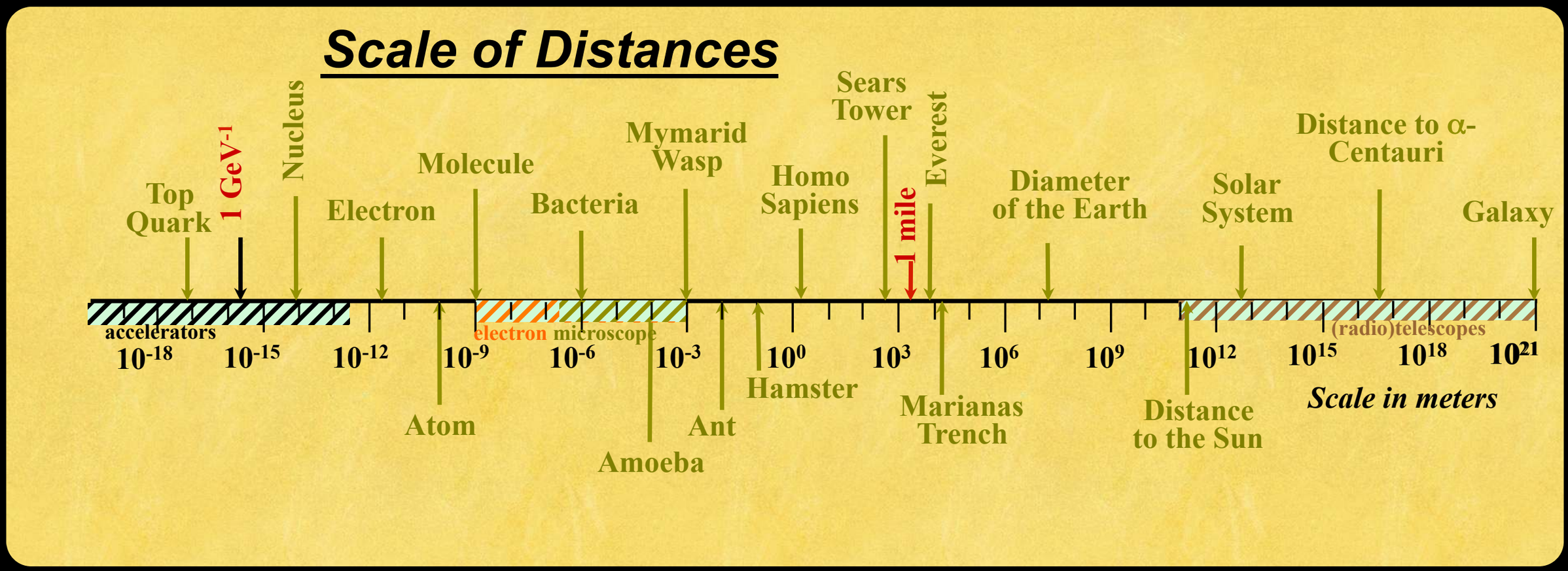
To do this, we need to probe to the *smallest distance* possible

Equivalent to working at the *highest energy* possible

Or the *hottest temperature*

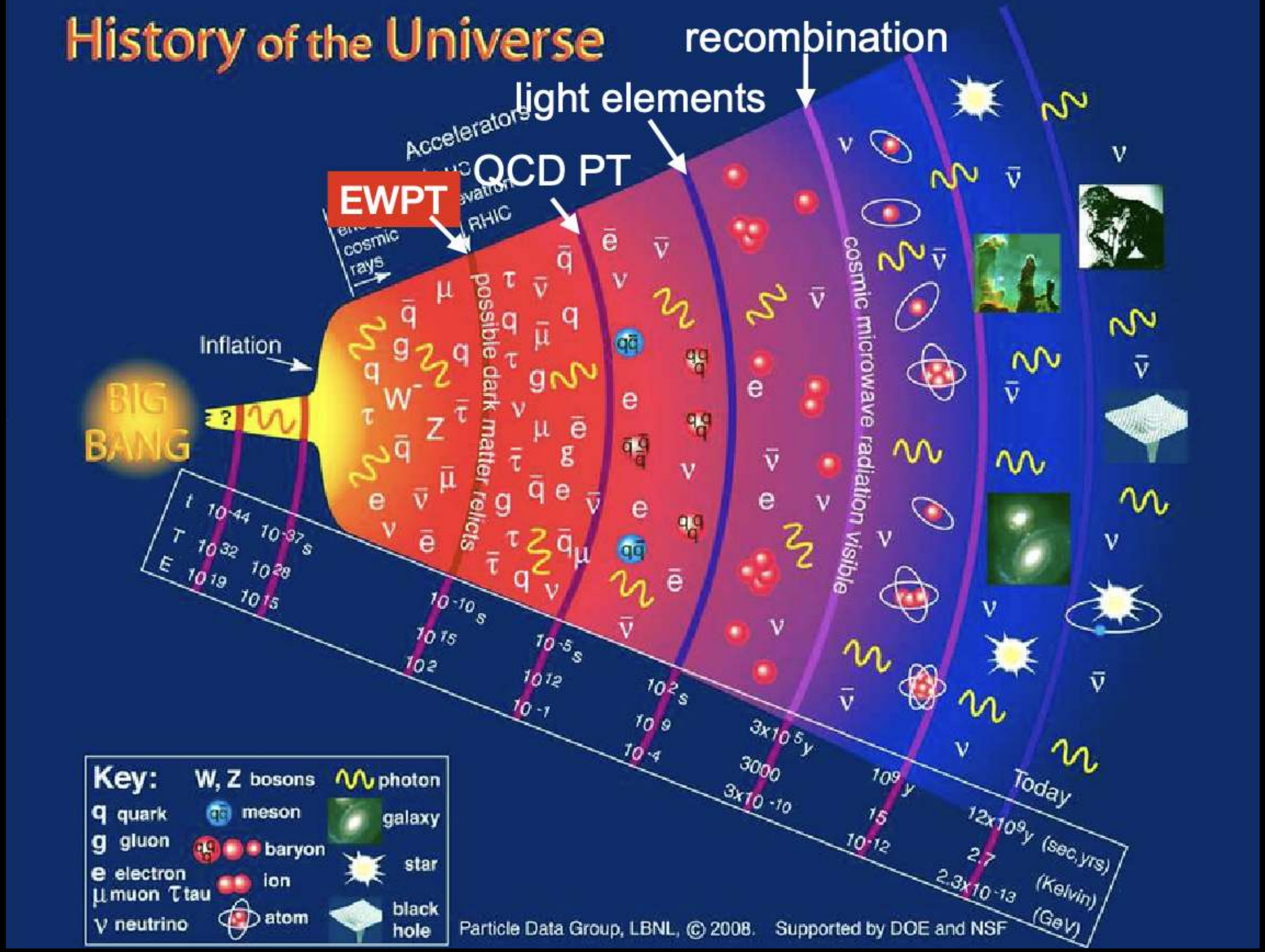
Or the e*arliest time* in the universe

Or look at the *rarest processes* for symmetry violations



Particle Physics probes distance scales that are as far from the atomic scale as the atomic scale is from everyday scales

History of the Universe

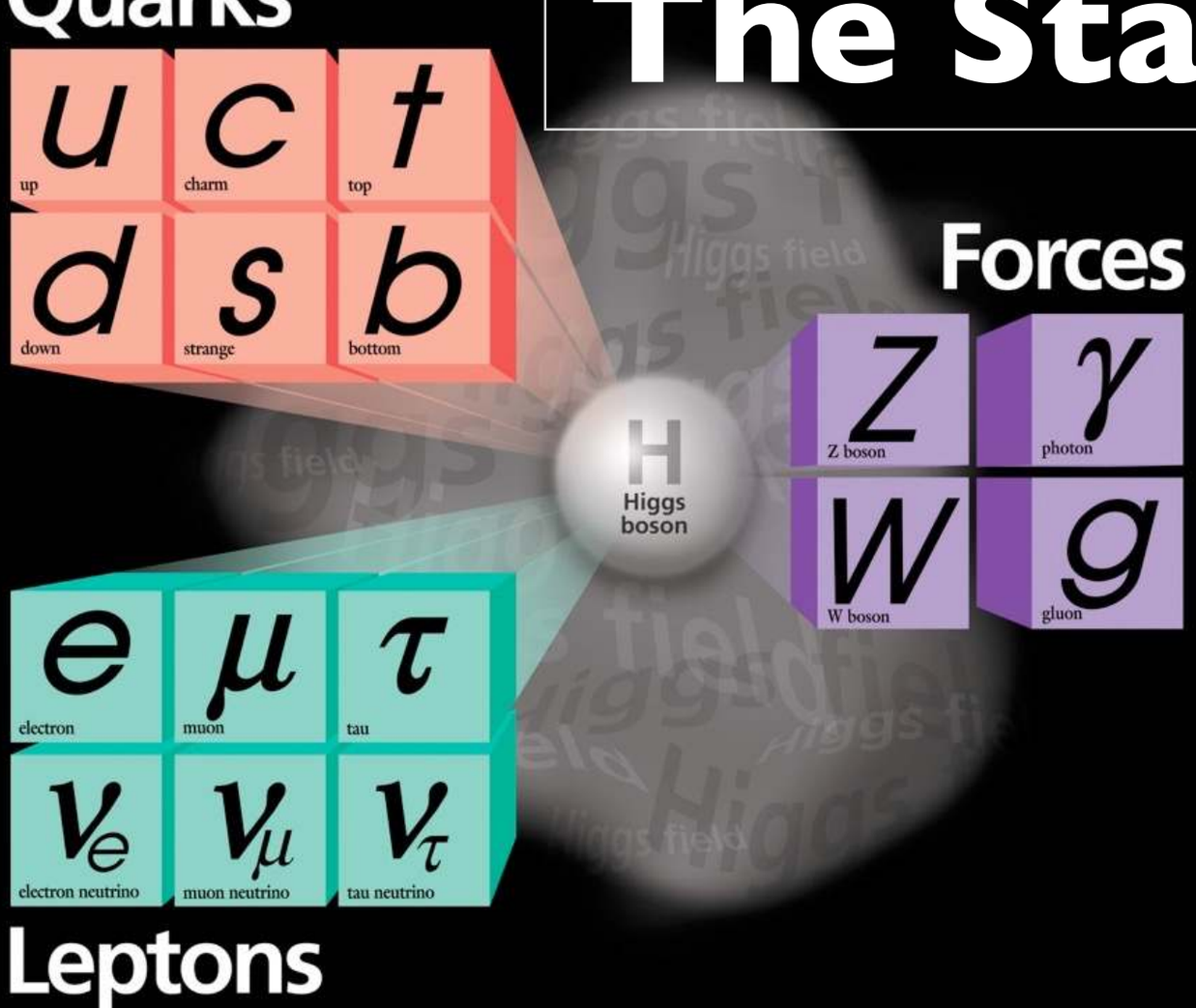


The physics we study is that of when the Universe was ~10^{-12} s old, or at a temperature of ~10^{17} K

For comparison, the core of the sun is ~10^{7} K, and the Universe is now at a temp of ~3 K

We have a mathematical framework that incorporates all the indivisible particles we know, (6 quarks and 6 leptons) and 3 of the forces (Electromagnetism, Strong, Weak, but not Gravity) and explains why (most) fundamental particles have mass

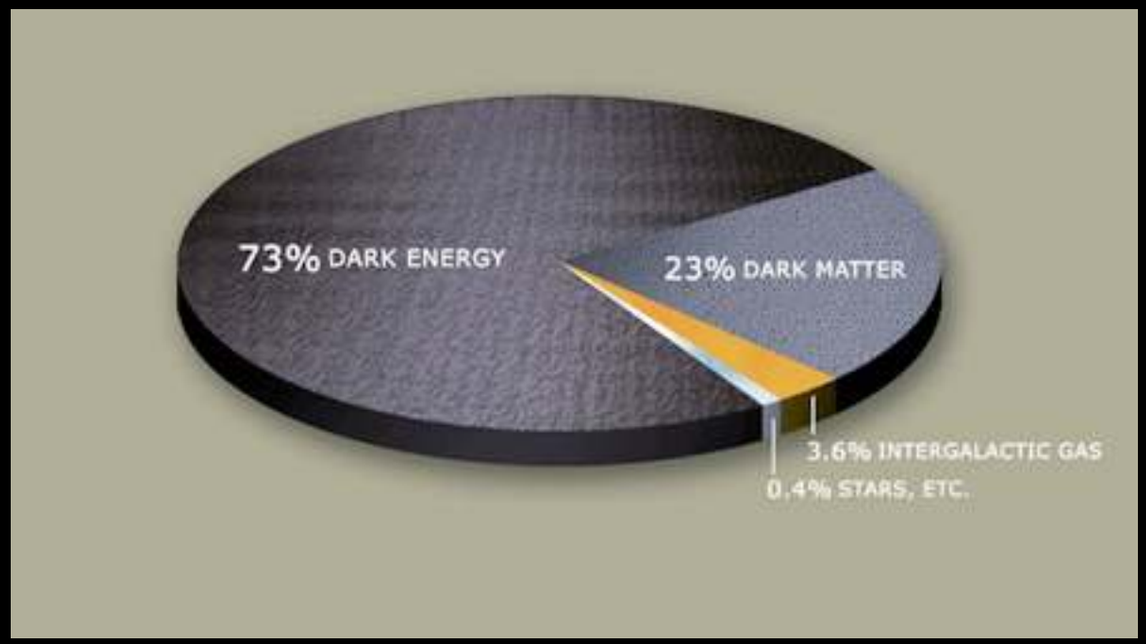
The Standard Model



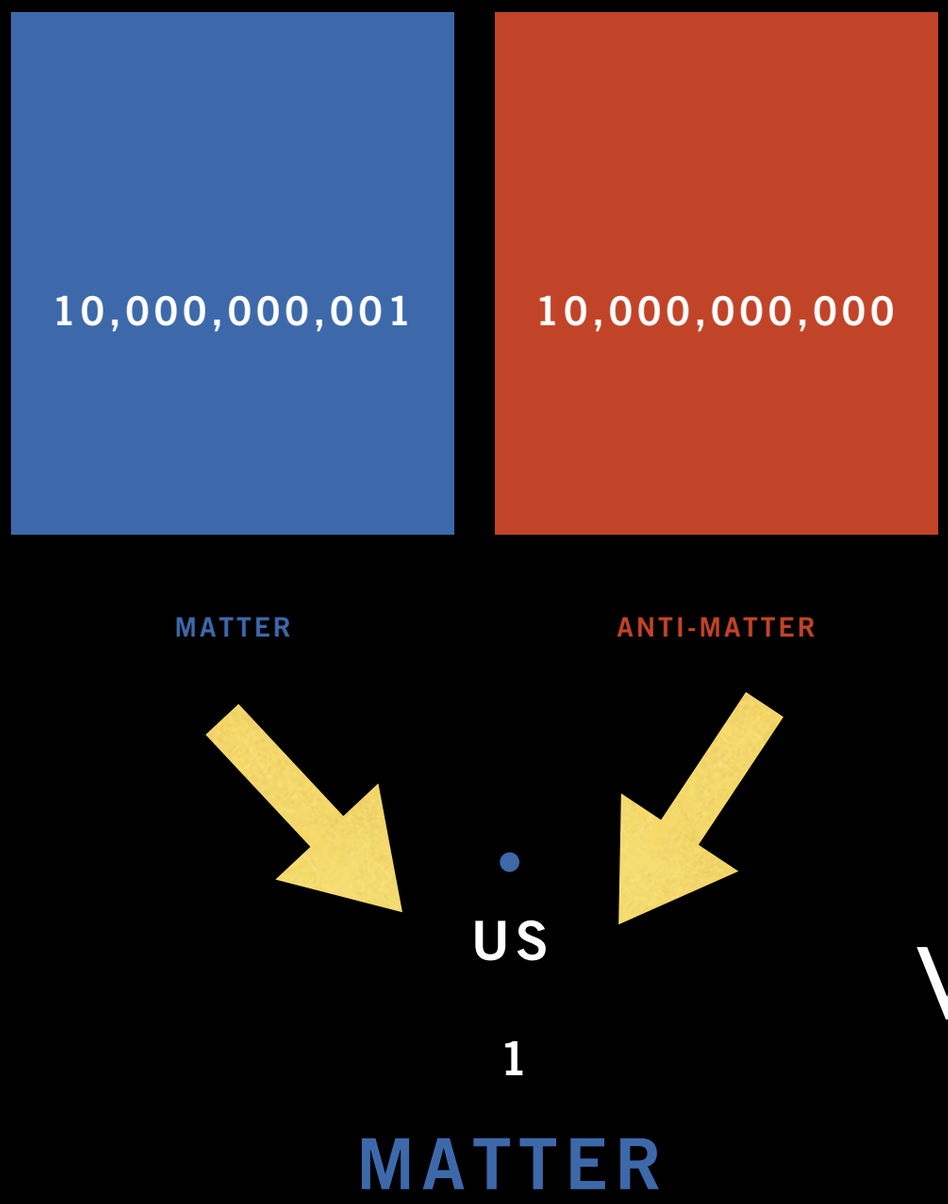
The Standard Model is one of the most well-tested theories ever.

However, it has many deficiencies that are very far-reaching

Still many Mysteries



What is Dark Matter?
Is there a whole
Dark Sector of particles?



Why is there any matter
left to make us?

- Why haven't we seen/measured these?
- Matter/Antimatter asymmetry: *Very small effect* - look for evidence in very rare decays of SM particles (Belle II, NA62)

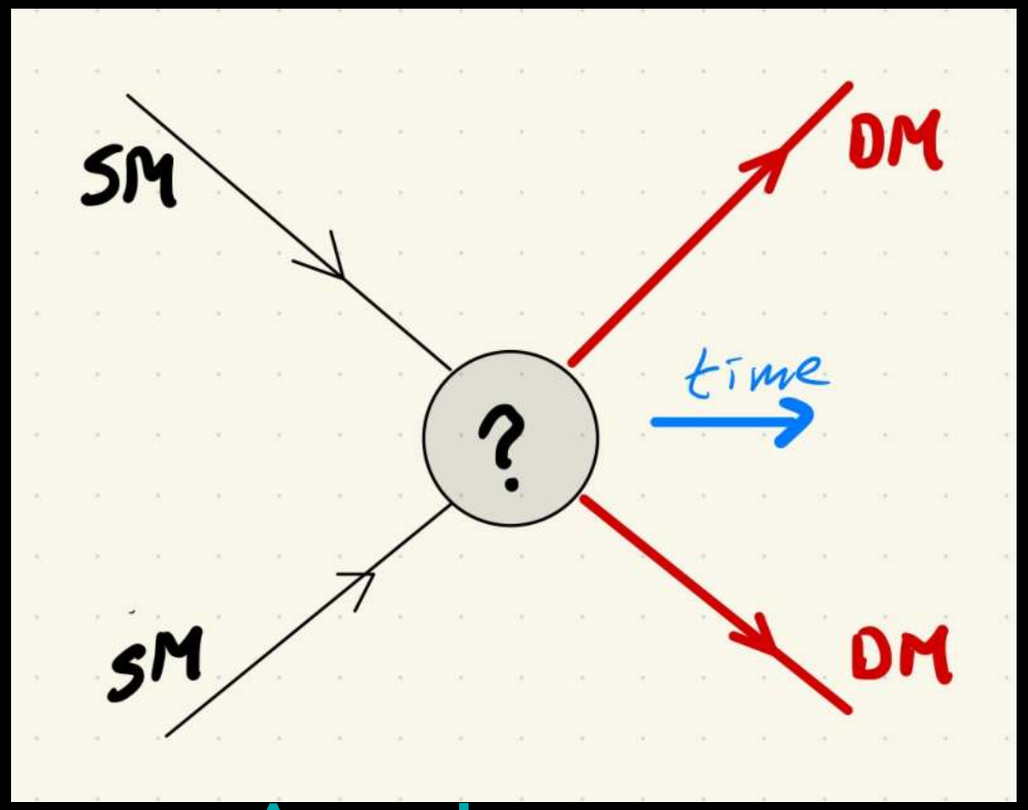
Search for Dark Matter

Cosmological DM must be neutral (hence "Dark")
Interacts *very weakly* with "normal" matter
At least one type must be stable

There may be a whole sector of Dark Matter particles

- eg Supersymmetry = all particles have new partners
- Extra Dimensions
- Dark Sector with different structure than SM

DM could be very heavy. Need high energy accelerator to make ($E=mc^2$), or use cosmological relic DM with underground detection
DM could be light - must have *extremely weak interaction* with SM (need high intensity/rare measurements)



Particle colliders let us create conditions from early universe! Eg: Large Hadron Collider: 10^{-12} s after Big Bang, highest energy in world

At several labs, collide protons/electrons, make Dark Matter in a lab to study

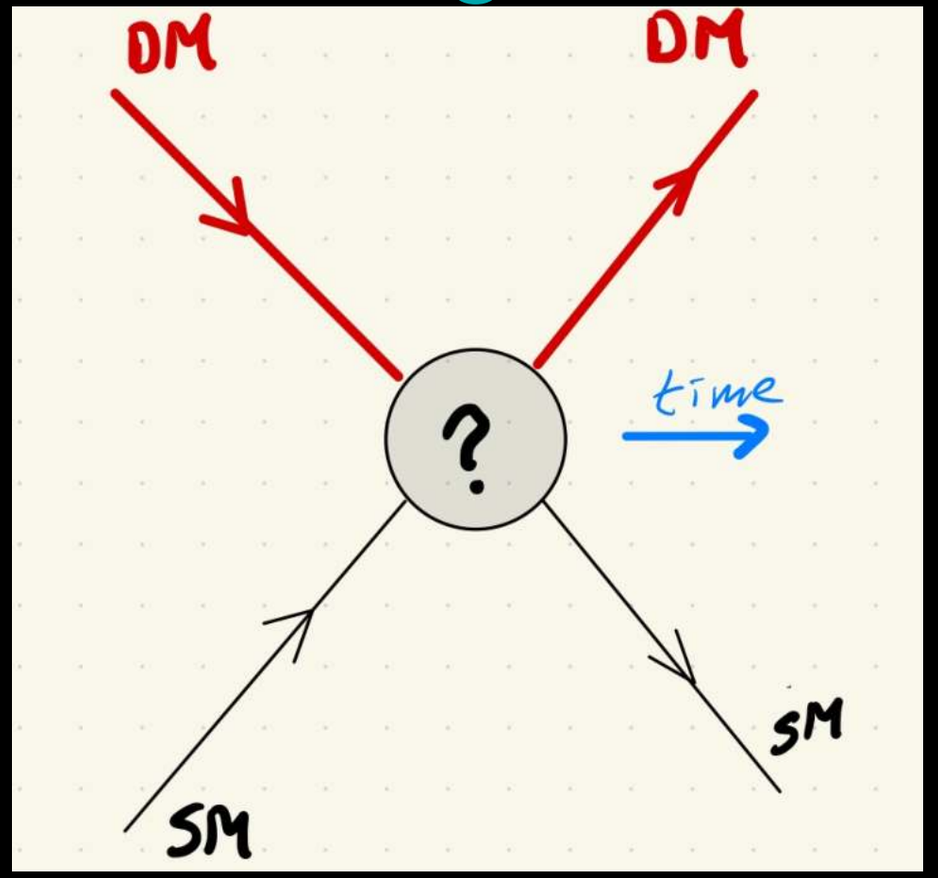
ATLAS, Belle II, Darklight

Accelerators

Underground

Let existing DM hit huge amounts of "normal" matter, look for extremely rare interactions

Eg: SuperCDMS @ SNOLab in Sudbury



Lot's of big questions still to address:

Can we write a Grand Unified Theory
that unifies all the forces?

Are quarks and leptons indivisible?

Where did all the antimatter go?

What is Dark Matter made of?

What is the nature of Dark Energy?

How many dimensions are there?

Are there new particles/forces to be found?

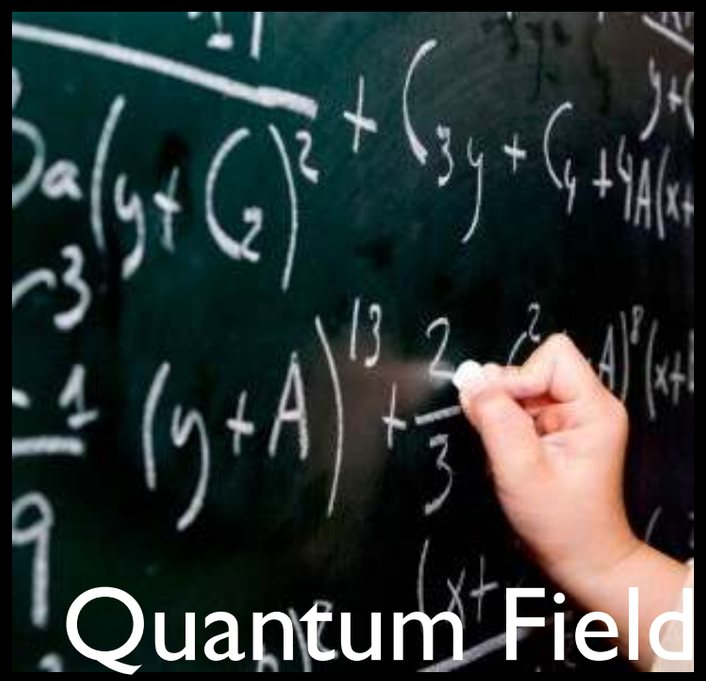
...

Tools of the Trade

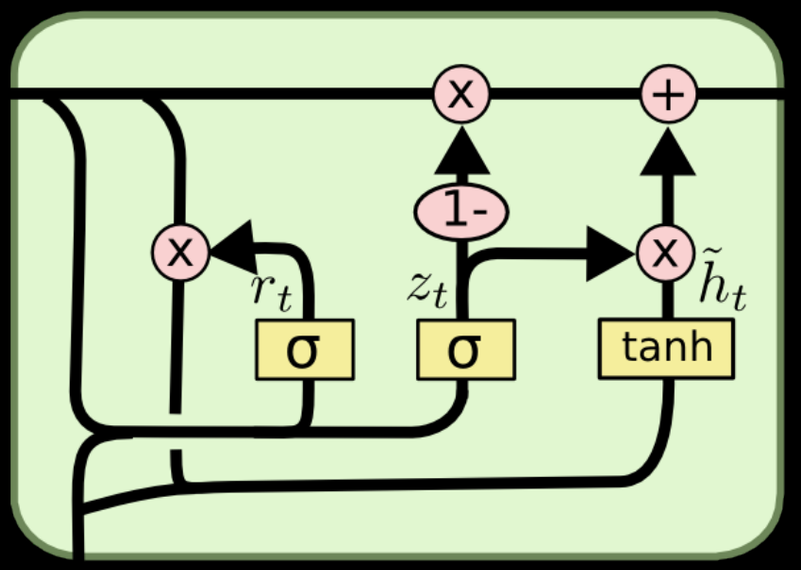
Accelerators

Massive Data sets

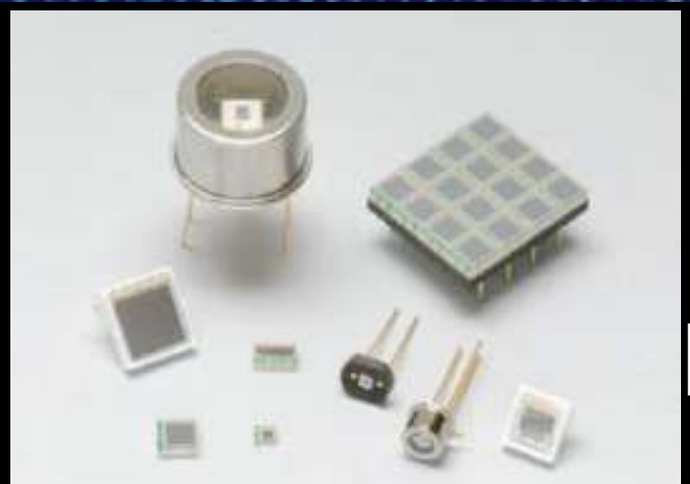
Underground labs



Quantum Field Theory



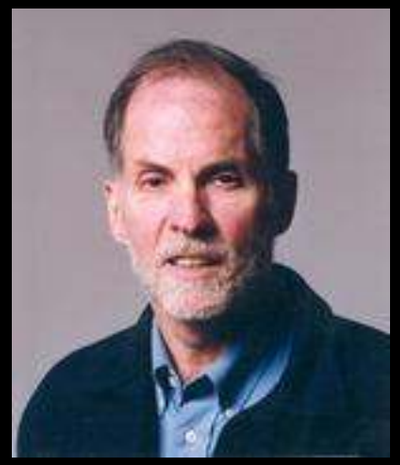
Machine Learning



Fancy detectors/electronics

Scott Oser

SuperCDMS



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NA62, Pioneer

Doug Bryman

Janis McKenna

Tom Mattison

TRINAT

John Behr

Biological Physics

&

Medical Physics

Thomas Young (1800s)

- Young's modulus, wave interference
- Trichromatic theory of color vision - physical optics and sensory physiology.

Albert Einstein (1905)

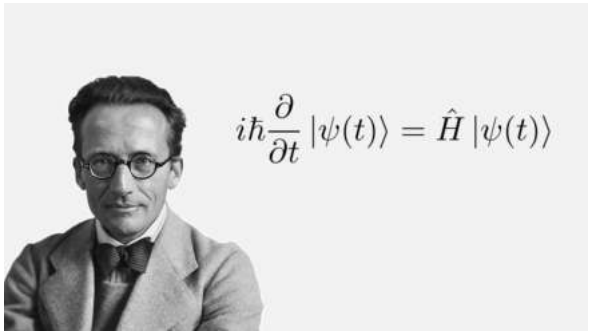
- Many, including Relativity and early QM photoelectric effect
- Theory of Brownian motion (1905)

gave biology a molecular ruler for diffusion/fluctuations

Hermann von Helmholtz (1840s–1850s)

E&M

Nerve-conduction velocity and founded physiological optics



Erwin Schrödinger

QM

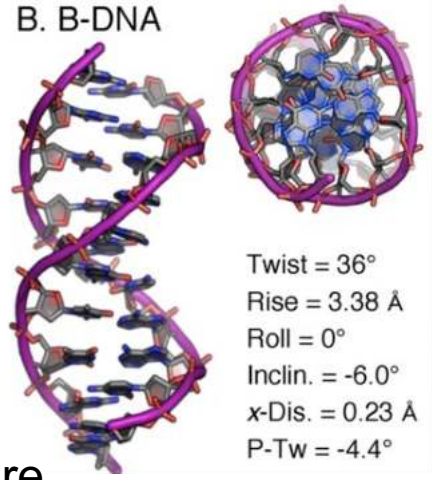
What Is Life? (1944):

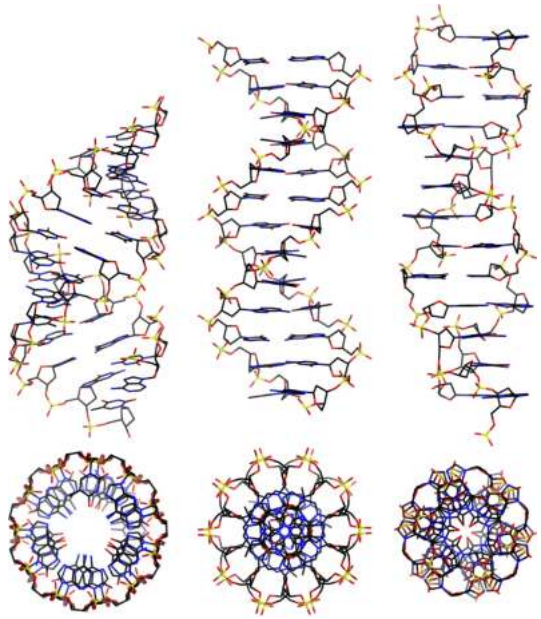
- "aperiodic crystal" + information-inheritance framing that energized the DNA era

Niels Bohr (1932–33)

Quantum mechanics

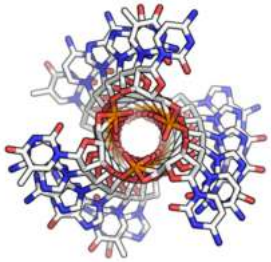
- "Light and Life" lectures -- biology might require new conceptual tools (complementarity)

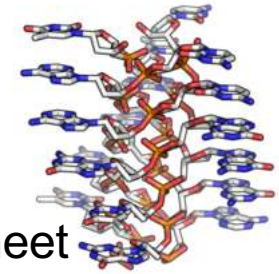


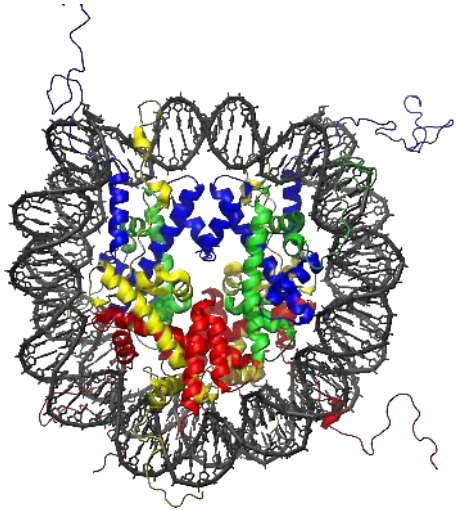


Francis Crick (BSc in physics)
Maurice Wilkins (PhD physics) (1950s)

- Central figures in deciphering DNA's structure and flow of genetic information.





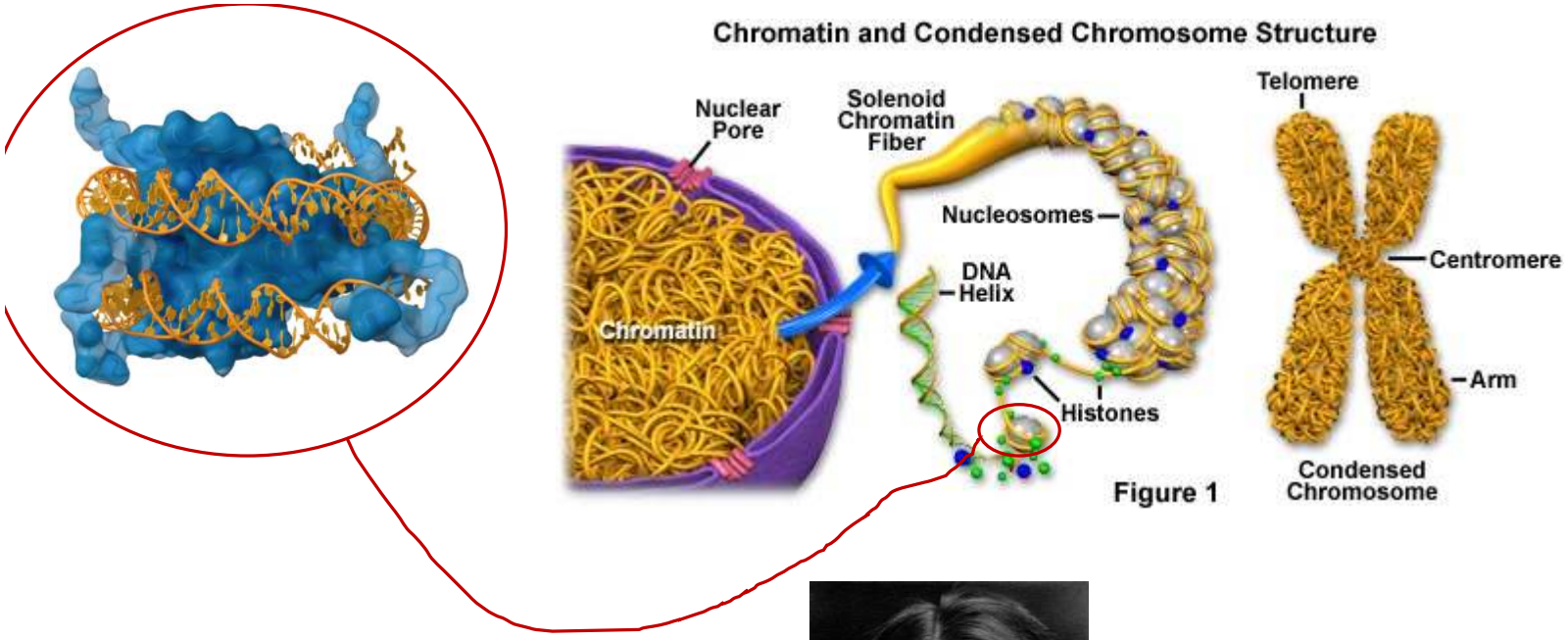


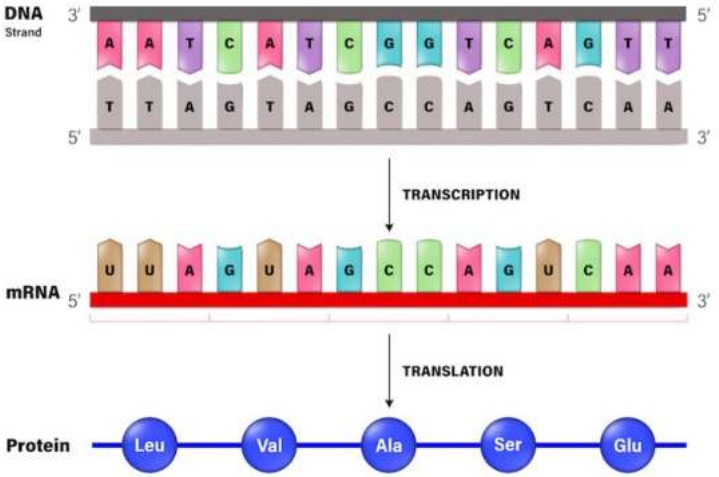
Linus Pauling (1940s-60s)

- Nature of the chemical bond

(electronic structure; valence bonds, hybridization)

- Many: Protein secondary structure: α-helix and β-sheet

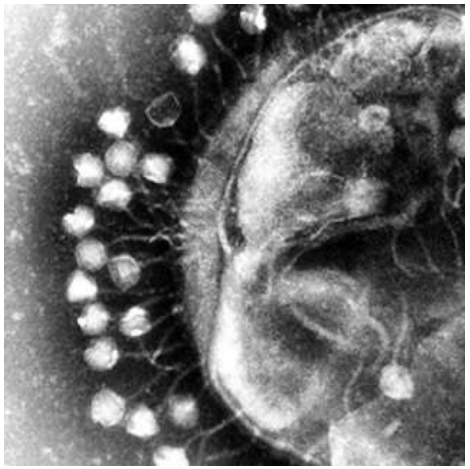


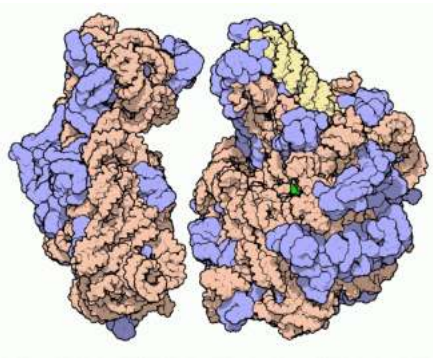


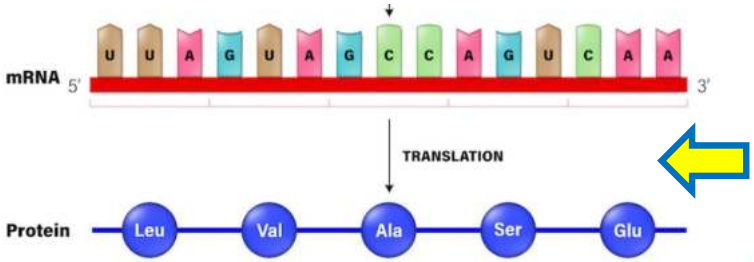
George Gamow (1950s)

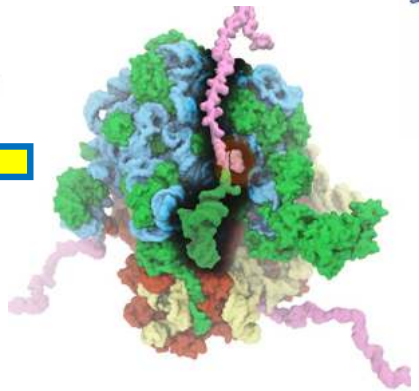
- Big Bang theory, quantum tunneling in α-decay
- The 3 letter genetic code

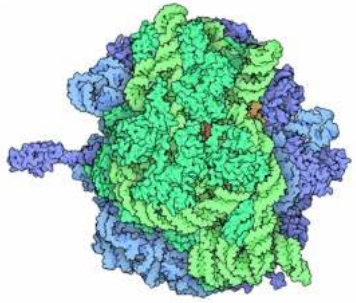
Max Delbruck (**PhD Physics**)
(1930s -1940s)
Origin of molecular biology
Genetic structure of viruses











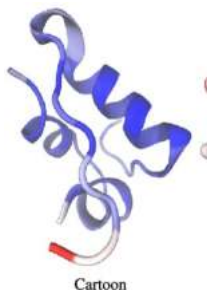
Richard Feynman (1959-1960)
QED; path integral QM; diagrammatic field theory
Phage genetics and ribosomes; Vision (Feynman Lectures) → ribosome as a universal machine

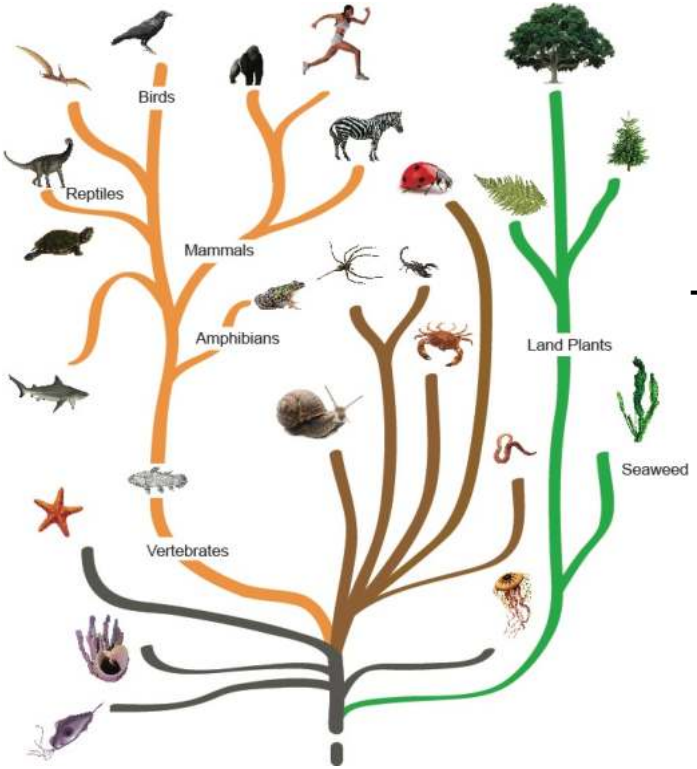
Heterologous expression

Many genes from 1 animal work in another animal

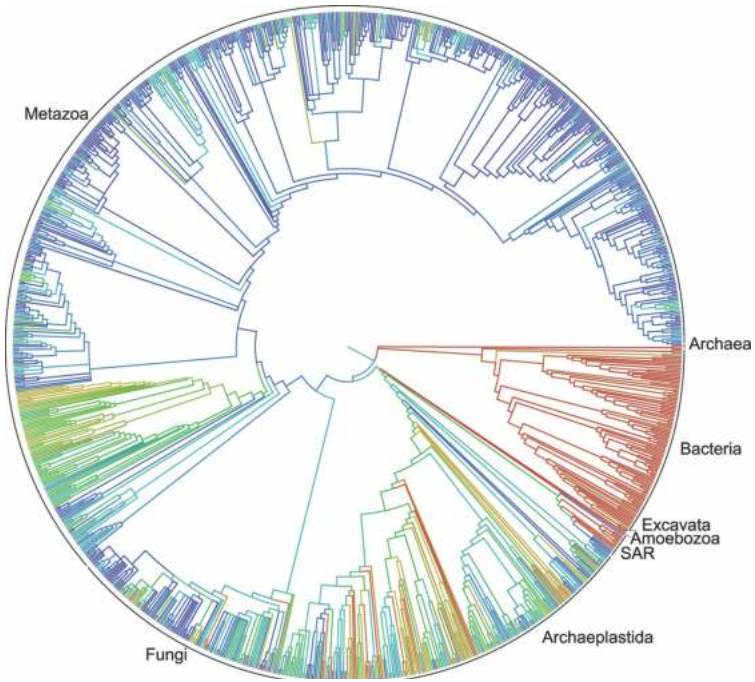
Banting, Best (U Toronto 1920s)

Porcine/bovine insulin to treat humans with diabetes





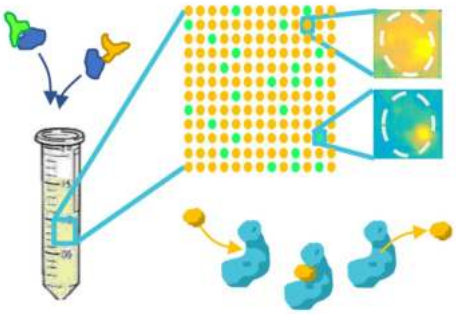
The universal genetic code



Biophysics

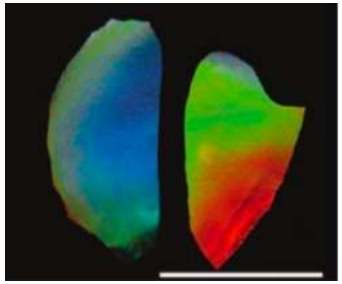
Leslie

Single-molecule microscopy,
Biophysics of DNA, RNA



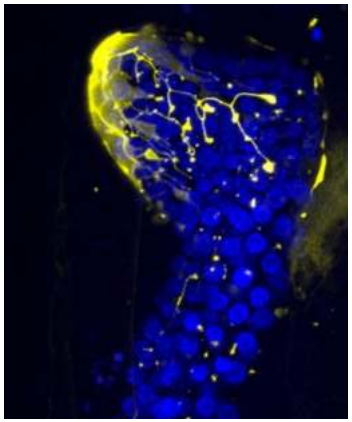
Michal

NMR and MRI, brain research,
spider silk, synthetic materials



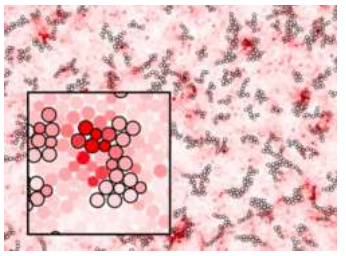
Plotkin

Origins of multicellular animals
Viral evolution; Genomics; Biomolecules

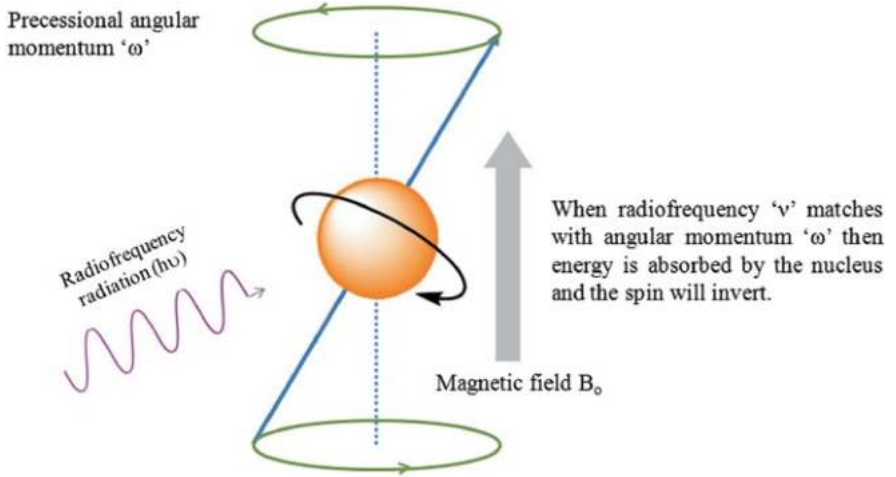


Rottler

Material properties from an
atomistic perspective, machine
learning, polymers, biomaterials



Edward Purcell and Robert Pound (1940s) (Physicists!)
NMR



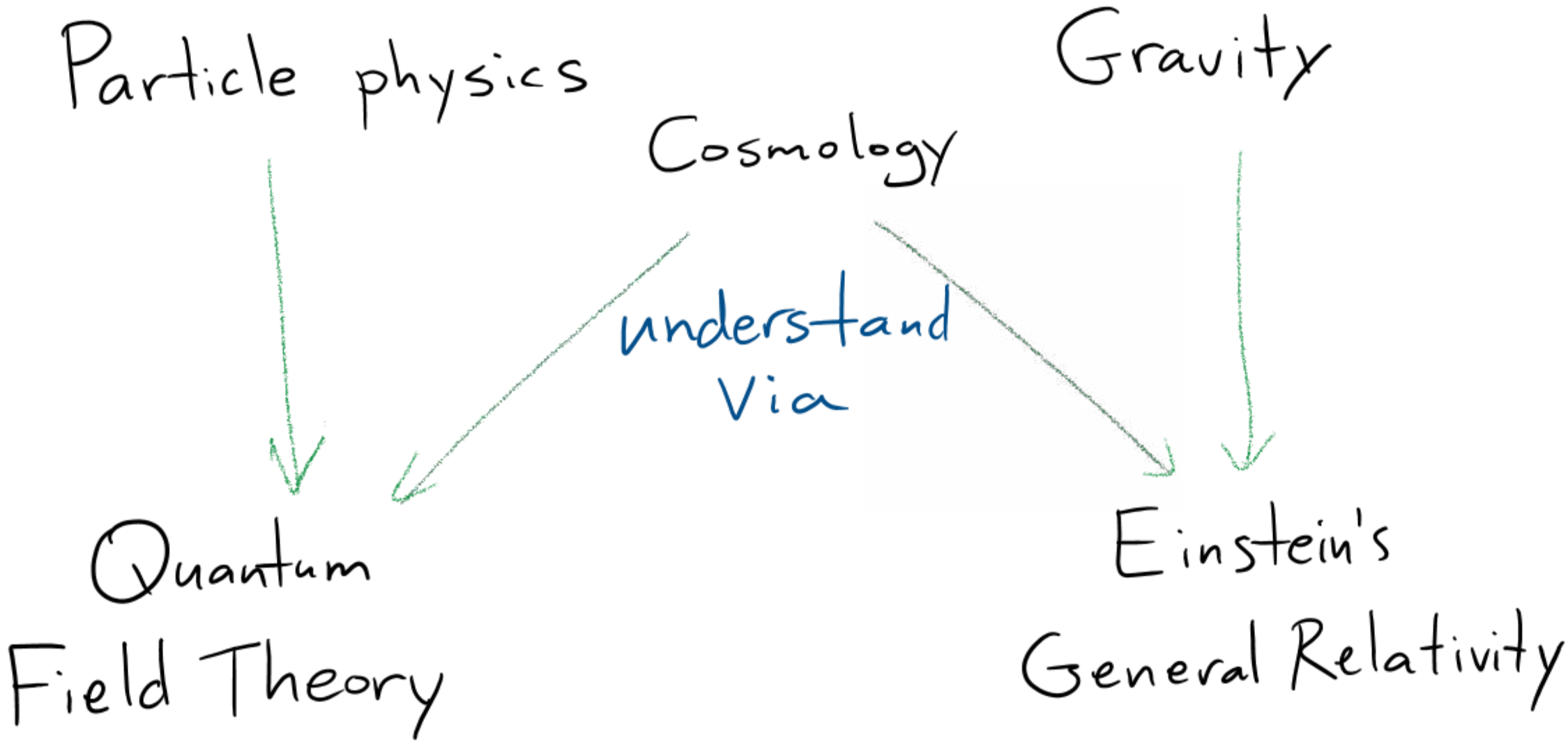
"Professor Purcell … said there would be essentially no practical applications for this esoteric academic field."
--N. Bloembergen

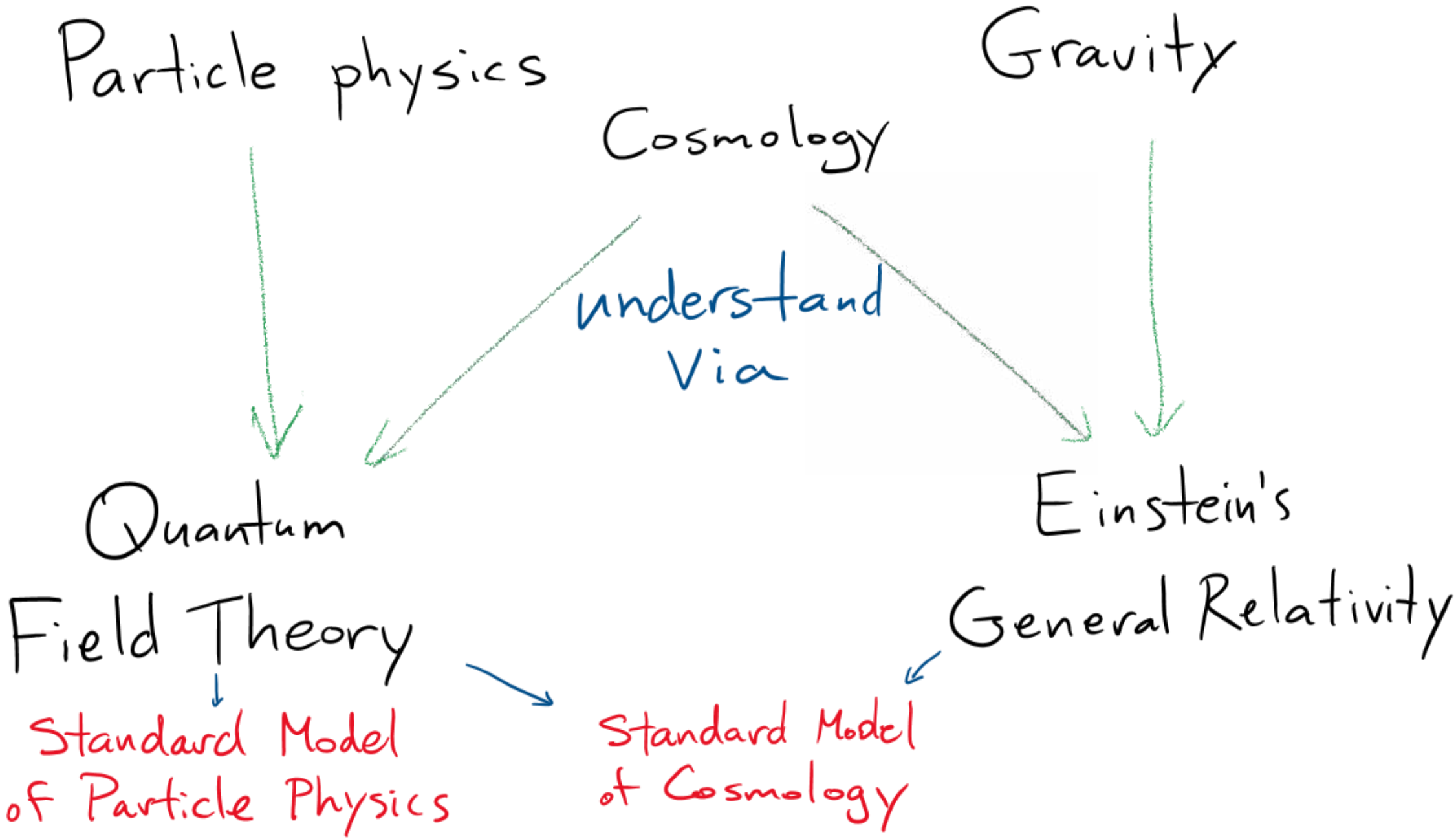
Reinsburg

Cancer Imaging, MRI

Sossi

PET/MRI Imaging


Particle physics
Gravity
Cosmology
understand
Via
Quantum
Field Theory
Einstein's
General Relativity


Particle physics
Gravity
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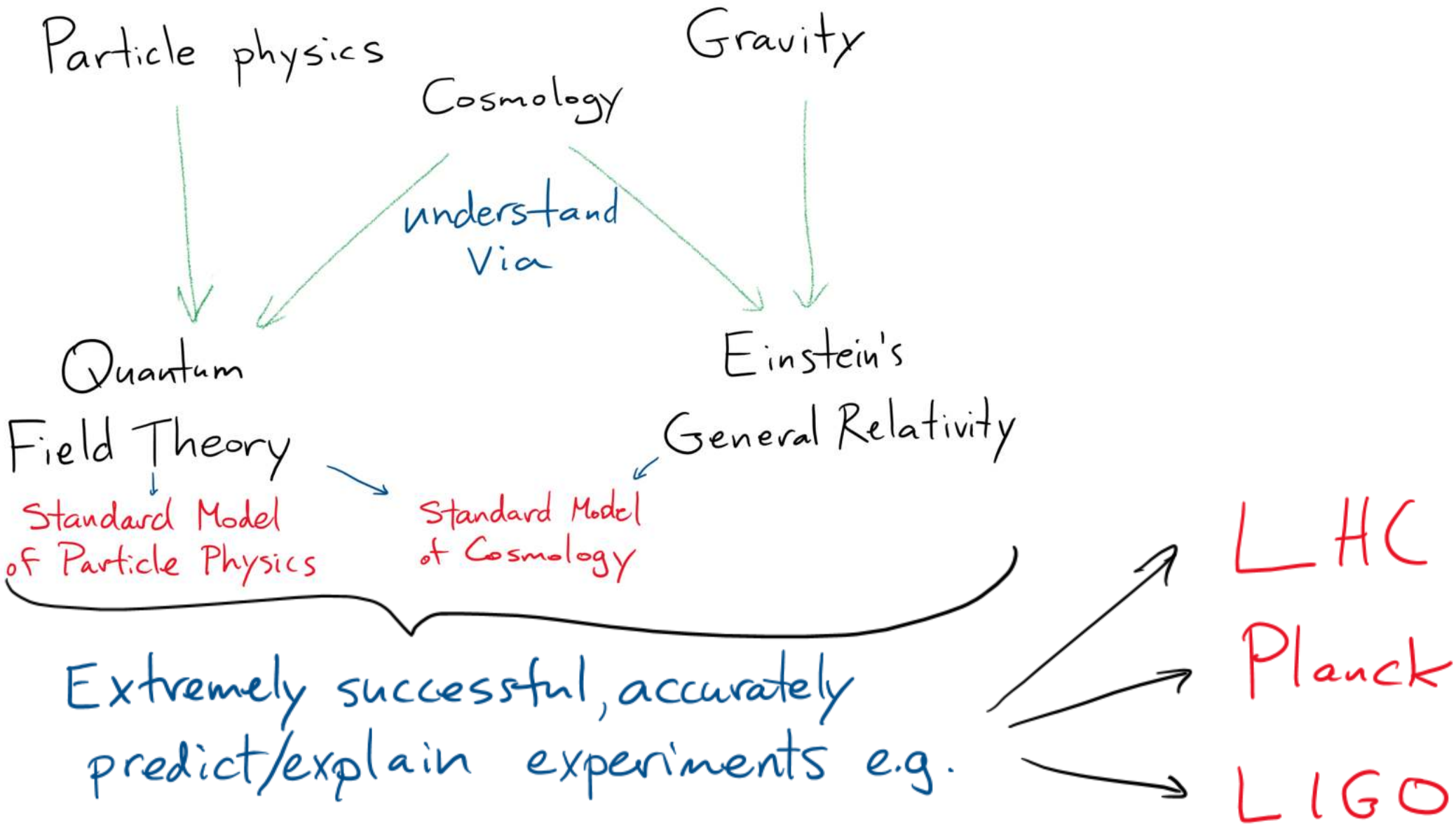
General Relativity
Standard Model
of Particle Physics
Standard Model
of Cosmology


Particle physics
Gravity
Cosmology
understand
Via
Quantum
Field Theory
Einstein's
General Relativity
Standard Model
of Particle Physics
Standard Model
of Cosmology
Extremely successful, accurately
predict/explain experiments e.g.
LHC
Planck
LIGO

Still many open questions:

What is dark matter?

What is dark energy?

Is there new physics beyond the standard model?

Why is there more matter than antimatter?

What is the origin structure in the universe?

PARTICLE THEORY & COSMOLOGY

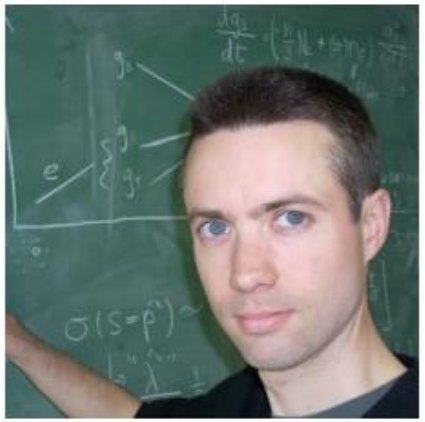
Kris Sigurdson

My theoretical research interests span **cosmology and its connections to fundamental particle physics and string theory**.

What physics do we need to explain **Dark Matter? Dark Energy? Inflation?**

David Morissey

Elementary Particle Physics



- **New particles and interactions** (e.g. supersymmetry, extra dimensions, strong forces)
- Interpretation and explanation of **LHC data**
- Candidates for **dark matter**
- Origin of the **matter-antimatter asymmetry**
- Ways to test this stuff **experimentally**

Eric Zhitnitsky

I work on **Quantum Chromodynamics (QCD)** in the unusual environment when **temperature, chemical potential**, the so-called **theta parameter are non-zero**. Such a study is important in the area where the **particle physics / nuclear physics / astrophysics / cosmology** are overlapped.

Theoretical aspects of gravity & quantum field theory

- what is the physics of black holes?
  - origin, distribution, mergers

- physics of black hole evaporation

- can exotic objects e.g. wormholes exist?

- what are the possible quantum field theories?

Can we understand quantum gravity?

string theory

AdS/CFT correspondence

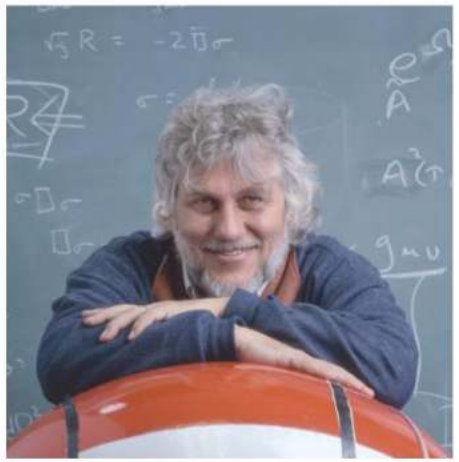
Where do time + space come from?

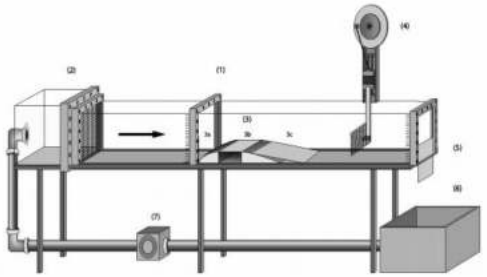
What is the big bang?

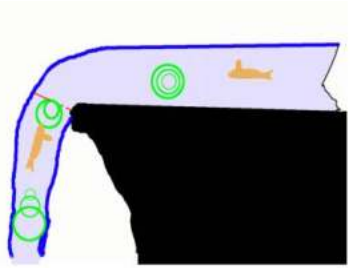
What's inside a black hole?

- also alternative approaches

Bill Unruh







Black Hole analogy: (above) Model black hole quantum emission in fluids
(water waves, BEC, optical)

Kristin Schleich

Classical relativity and quantum gravity, especially the role **topology** plays in the classical and quantum dynamics of our universe.
General relativity in **higher dimensions**, with a focus on problems related to **M-theory and string theory**.

Quantum Cosmology

+

Foundations of Quantum Mechanics

PHILIP STAMP

Decoherence in quantum gravity

Alternatives to standard quantum mechanics gravity

Matt Choptuik

Numerical relativity at UBC:
see **http://laplace.phas.ubc.ca** for more info.

Joanna Karczmarek

also:
simple models
for low D
gravity

Moshe Rozali

quantum
chaos
& black holes

connections
to quantum
information

Mark Van Raamsdonk

Can quantum gravity
models teach us
about dark energy,
cosmology?

connections to
condensed matter
physics

Gordon Semenoff

I work on **theoretical elementary particle physics, quantum field theory and string theory**:

Graduation & Beyond!

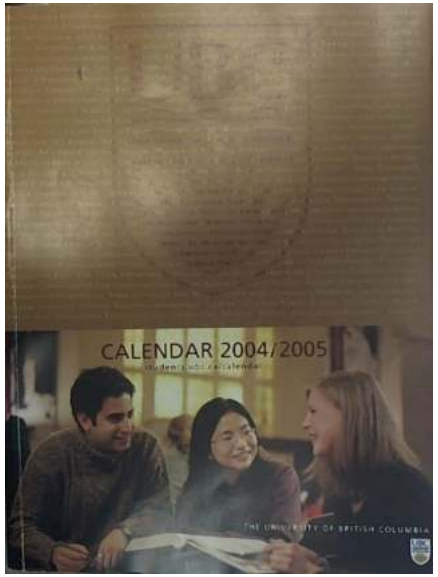
Graduating?

You must follow all of the requirements from one year of the calendar (normally your 2nd year – when you entered the program

Honours requirements (>68% average, 27+ credits/year (except in final year when you should take only as many credits as needed to graduate)

Arts/Breadth requirements

*No matter what you see on phas.ubc.ca (which we to try to keep up to date) or anywhere else on the web, the **UBC calendar is 'the rule book'** and defines what is required to get a degree from UBC.



The Calendar

Most of what you really need to be familiar with can be found under:

- Faculty of Science BSc requirements:
https://vancouver.calendar.ubc.ca/faculties-colleges-and-schools/faculty-science/bachelor-science

- Specialization requirements (for PHAS programs):
- Astro:
- https://vancouver.calendar.ubc.ca/faculties-colleges-and-schools/faculty-science/bachelor-science/astronomy

- PHYS/BIOPHYS/Other combined programs:
- https://vancouver.calendar.ubc.ca/faculties-colleges-and-schools/faculty-science/bachelor-science/physics

The calendar's search tool is not always the easiest way to find what you are looking for...

Graduating?

You must **apply** for graduation!

Deadline: February

See:https://students.ubc.ca/enrolment/graduation/applying-graduate and
https://science.ubc.ca/students/requirements/graduation

What happens if you run into issues?

With a Course:

•Talk to your prof.

•If the prof can't rectify – talk to an advisor or u/g chair

With the program

•Administrative issues: talk to the u/g coordinator Shawn Salgadoe

•Advising: program advisors (Profs. Ye/Schleich/Boley/Leslie)

With life (health, finance, harassment, careers, anything…)

- https://students.ubc.ca
- Science advising
- But also – talk to the person who is most likely to be of immediate help: your profs, advisors and u/g chair

New: Faculty of Science wellness hub:
https://science.ubc.ca/students/wellbeing

Getting into Research

Getting into Research I

Majors students will be exposed to research topics in PHYS 348. You'll explore current research topics in depth, write reports and give presentations. Honours students often like to take this, too.

All Honours students take the PHYS 449 or ASTR 449 thesis course, working with a supervisor over the course of a year and conducting original research.

Anyone wanting to take PHYS 349 or ASTR 349 (Directed Studies = mini-thesis) should contact Prof Douglas Scott for approval (typically requires 75% accumulated average and have a research project and supervisor in mind or under discussion).

449 Thesis, 349 Mini-Thesis

Discuss your ideas/interests with potential supervisors.

Many potential supervisors: faculty members, including adjunct professors whose research is based off campus.

Supervisors don't have to be UBC PHAS affiliated at all, but you'll need a PHAS co-supervisor if supervisor non-UBC

Send email, knock on doors!

Self-motivated:

- You'll work with advisor & PHYS 449/PHYS 349 instructor as your guides/mentors.
- You'll learn how to conduct research, write it up & give scientific presentations.
- Your thesis project is your own work.

Getting into Research II

There are other opportunities to do research while in the department:

- Summer NSERC USRA awards (deadline in January)
- Co-op terms
- Direct hiring by professors

For these and for 449/349 projects, don't hesitate to contact professors to help you figure out what to work on – we are used to having students ask us about projects, and can often find a project to fit students' strengths and interests.

Research: Your Opportunity

Examine your interests, seek opportunities

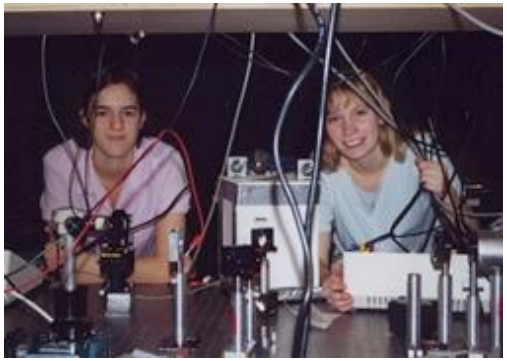
Talk to senior undergrads about their research experiences (meet them via PHYSSOC activities or in PHYSSOC lounge)

Research happens not only in academic institutions, but also government labs, high-tech industry and private companies.

Experience in computing/programming/design is a huge asset, whether seeking a job or seeking a graduate school position.

Ditto for technical experience.

I strongly recommend trying different opportunities, both inside and outside of university setting.



Paid Work/Research Opportunities for PHAS Undergrads

-op http://www.sciencecoop.ubc.ca/ (4- ,8-, or 12- month co-op jobs)

Everything below page is normally valid for co-op workterms – but you must get Co-op Director approval

SERC USRA (Undergrad Student Research Award)

https://www.nserc-crsng.gc.ca/Students-Etudiants/UG-PC/USRA-BRPC_eng.asp

RIUMF Summer student program (and 4-, 8- or 12-month co-op jobs

https://triumf.ca/people/undergraduate-program/

RC (National Research Council Canada

https://nrc.canada.ca/en/corporate/careers/post-secondary-students

AAD RISE (German Research Internships in Science & Engineering

https://www.daad.de/rise/en/rise-germany/ UBC is a DAAD partner

BC Go Global - Research Abroad

https://goglobal.ubc.ca/go-global/programs-ubc-students/research-abroad

More Go Global international experiences http://students.ubc.ca/career/international-experiences

BC SURE (Science Undergraduate Research Experience):

https://science.ubc.ca/students/blog/research-opportunities-science-undergraduates-2024

ESTE (International Association for the Exchange of Students for Technical Experience):

http://www.iaeste.org (Canadian IAESTE office: https://iaestecanada.org/)

BC Work Learn International Undergraduate Research Awards

https://students.ubc.ca/career/ubc-experiences/work-learn-international-undergraduate-research-awards

BC Quantum Pathways (for students belonging to an underrepresented group)

https://qmi.ubc.ca/programs/quantum-pathways/

stitute of Particle Physics, IPP Canada/CERN summer program

https://particlephysics.ca/research-activities/undergrad-program-cern/?lang=en

rimeter undergraduate programs

PSI Bridge: https://perimeterinstitute.ca/training/undergraduate-bridge-program

PSI Start Program: https://perimeterinstitute.ca/training/undergraduate-program

After Physics & Astronomy at UBC