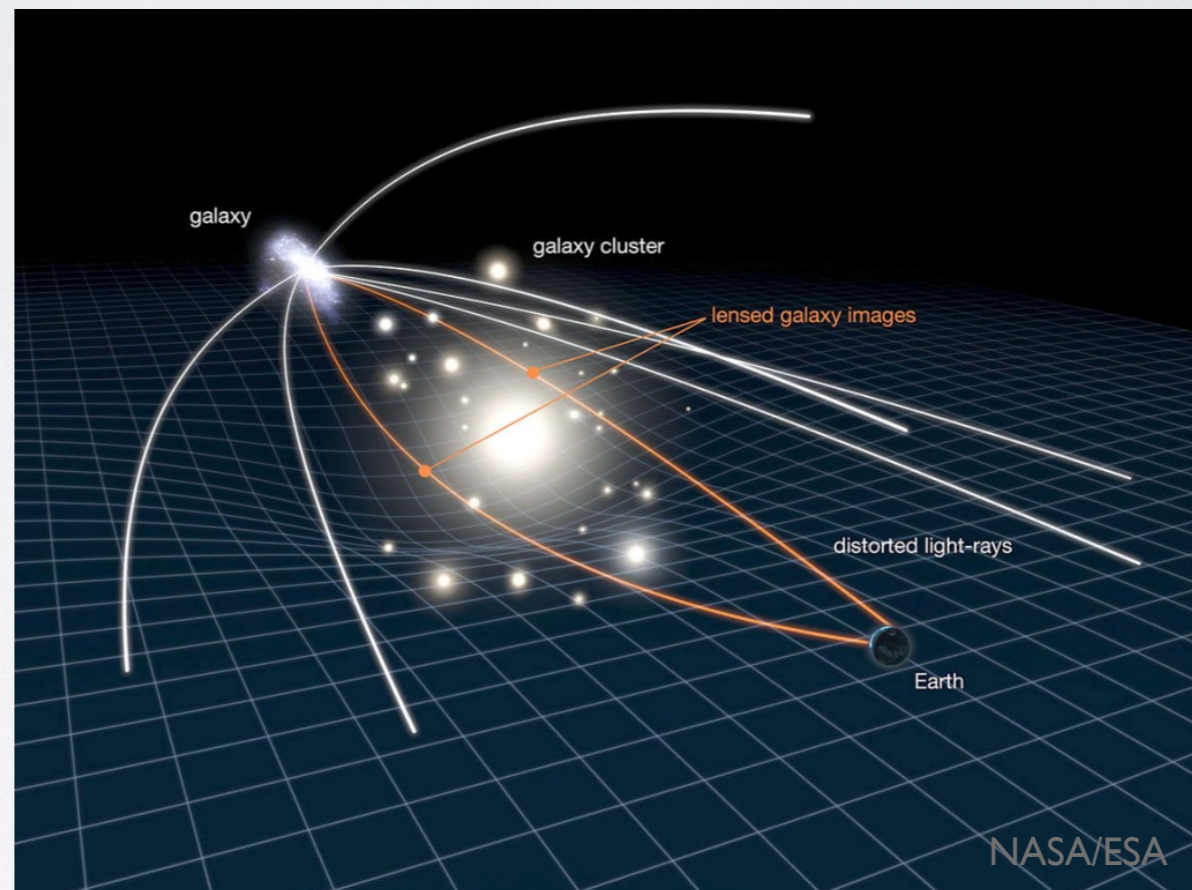
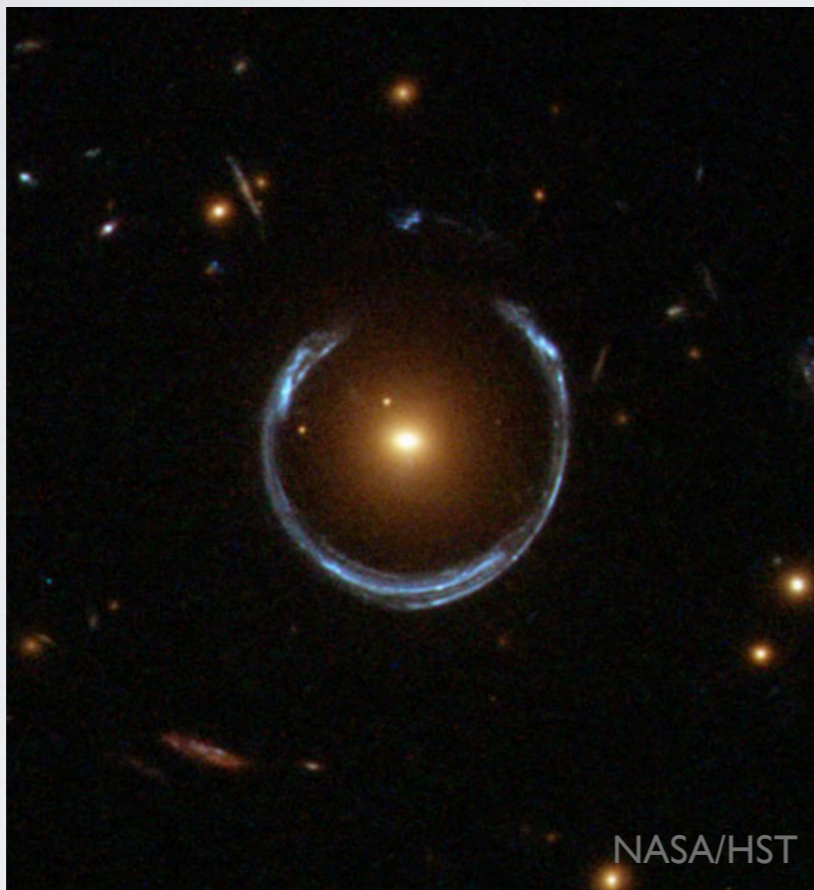


Week 9 - #1

Calculus of Variations (III)



Today: Ch 6.6, 7.1-7.3

Next Class: Ch 7.3-7.4

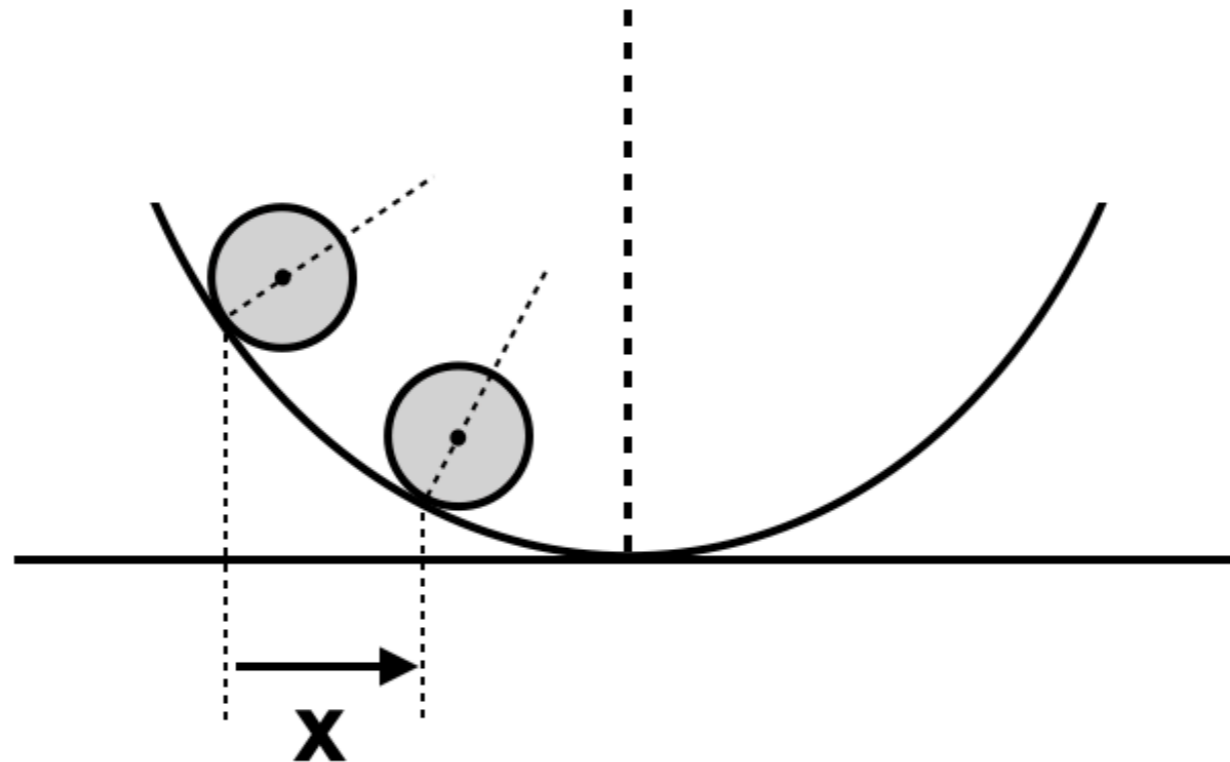
Ji-hoon Kim (Seoul National University)

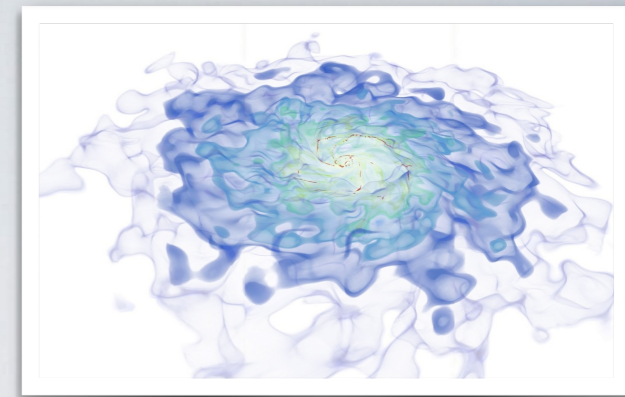
Classical Mechanics I (Spring 2026): Quiz #15

— [open book and open note, **but** no cellphone or laptop, drop it off as you leave the class] —

Please write down your name and student ID in the top right corner. (0.0 pt: no paper found with your name / **0.2 pt**: paper found with your name and some answers / **0.5 pt**: good answers)

1. Thornton & Marion, Problem 6-4.
2. Study the definition of “equation of constraints” in the first 10 lines of Chapter 6.6. Then, Thornton & Marion, Example 6.5.
3. If you have time: Now, consider the disk rolling without slipping inside the parabola $y = ax^2$. Assuming the radius of the disk is small enough to contact the parabola at one and only one point, determine the equation of constraints in terms of the “generalized coordinates” x and θ .





Check your midterm score by Apr. 29

(Grader TAs: p1, 2 - 정은우, cewgenius@snu.ac.kr
p3, 4, 5, 6 - 서선기, supercap@snu.ac.kr)

(Mean: 10.16 / Standard Deviation: 4.77)

(Claim hour: **Apr. 28, 17:30-18:30, 22-4 | 2** (right before the TA session))

Exercise Classes

- Recommended (even if you don't take the exercise course).
- Two courses awarded with the same grade.
- Tue/Wed, 18:30-19:45 (22-412), Week 9 starts on Apr. 28 (Tue)

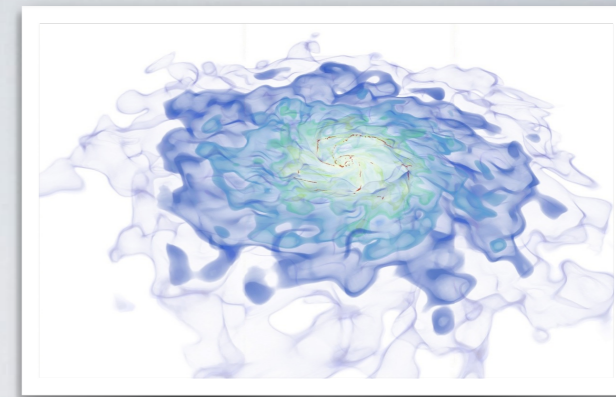
	출석	과제	중간	기말	수시평가	태도	기타	합계
	5	30	20	25	15	5	0	100
* 3. 평가방법	출석 규정 : 수업일수의 1/3을 초과하여 결석하면 성적은 "F" 또는 "U"가 됨 (담당교수가 불가피한 결석으로 인정하는 경우는 예외로 할 수 있음)							
	기타의 비고 :							

- Our TAs (schedule may change due to the TA's other responsibilities):

정은우 (cewgenius@snu.ac.kr, Exercise class week 3-7, HW #1)

서현우 (hyeonu@snu.ac.kr, Exercise class week 9-12, 14, HW #3)

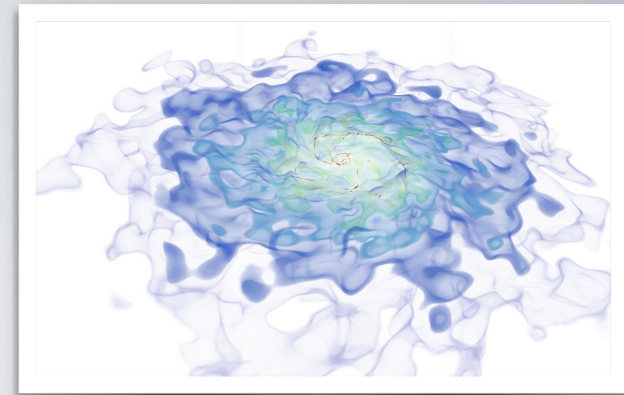
서선기 (supercap@snu.ac.kr, HW #2, #4)



No Class, No TA Session on May 5



Make-up TA Session on May 7 (Thu)



Term Project Paper

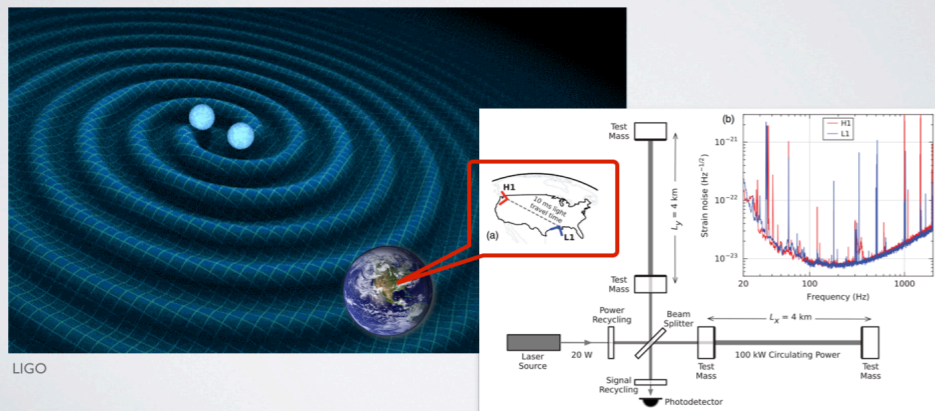
Vote For The Best By Tomorrow

- Please **look through the submitted slides**, and vote for the most interesting, promising, and original progress report!

<https://docs.google.com/presentation/d/1MacIw4-myQQ3n05BoOnyfAbkaqpHYI20VirbdzBzJP4>

LIGO Gravitational Wave Signals

- Signals from distant events that distorted the spacetime fabric.
- **A new window to the Universe** opened up in addition to the good old electromagnetic window.



Abbott et al. (2016a)

www.jihoonkim.org

Extra credit guideline

- **Additional +2:** awarded to 2-3 students who were voted the best by your peers, and to 2-3 students who provided the most useful feedback.

Vote For The Best By Tomorrow

- For the remaining **0.5 point** for your attendance score today.
- Go to jihoonkim.org → Teaching → Progress Check “Vote”
- Or: <https://forms.gle/VRjUBkjSpjeffWqs7>

Week 03-2. Oscillations

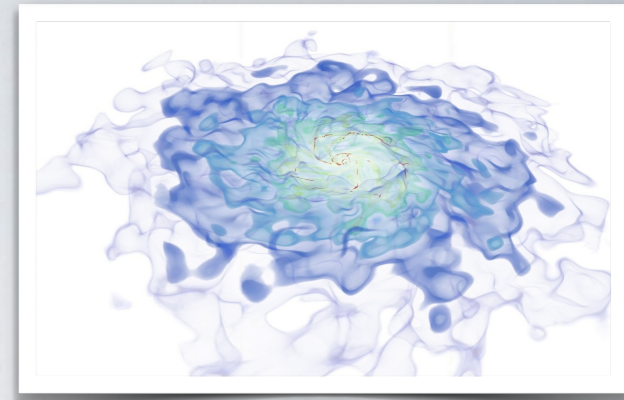
Week 04-1. Nonlinear Oscillations and Chaos

Week 04-2. Nonlinear Oscillations and Chaos + Term Project Paper How-To

Week 05-1. Nonlinear Oscillations and Chaos + Term Project Progress Check (all slides) + Vote (link)

Week 05-2. Gravitation + 2nd Homework (pdf) + Solution (pdf)

- Select 2 students you find promising - **not** yourself!



Term Project Presentation

Essential Skillsets For (Astro)Physicists

Competent Researcher

Oral Communication Skills

- How to present long and short talks
- How to answer questions
- How to make an elevator pitch

Written Communication Skills

- How to write papers and proceedings
- How to write referee reports
- How to respond to referee reports

Solid
Research

Physical Intuition

Understanding in
Computing Technology

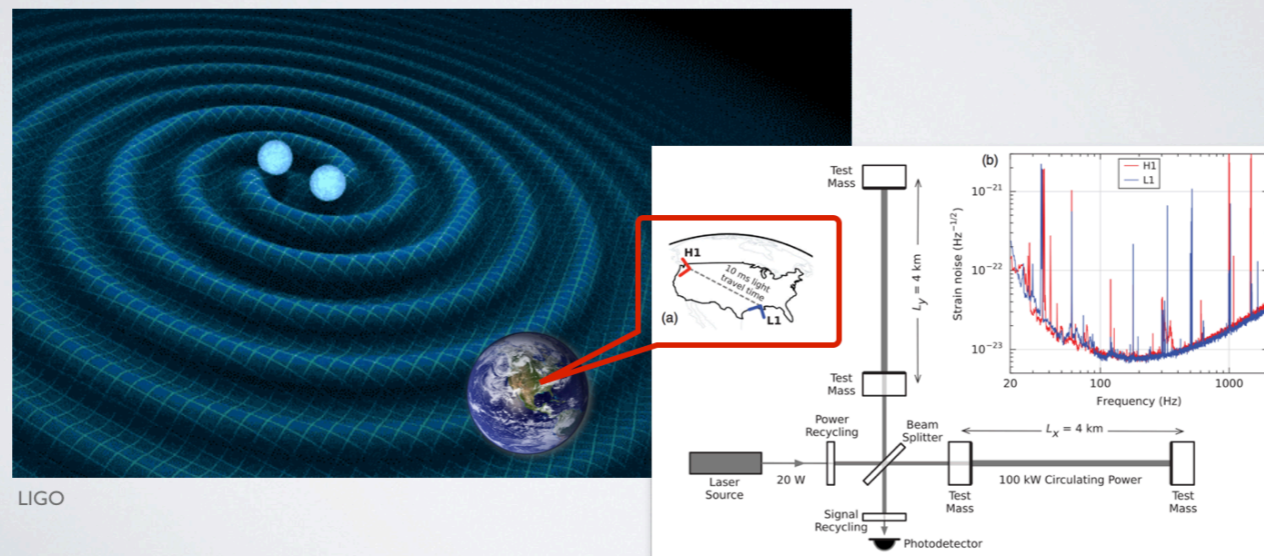


Term Project Presentation (Jun. 9)

- 10-min presentation (+ 1-min Q&A) with maximum 6-page slides (including the title page) to present your term project.

LIGO Gravitational Wave Signals

- Signals from distant events that distorted the spacetime fabric.
- A new window to the Universe opened up in addition to the good old electromagnetic window.





Term Project Presentation (Jun. 9)

- Please think of this not as an exam, but as **a time to introduce your fellow student to an interesting topic you want to share.**
- Your presentation material will be evaluated by your peers.

Vote For Best Presentations!

Physics I (Spring 2023)

- Use your best judgement to select who you found have carried out the best term project research and made the best presentation material, by May 27 (Sat), 23:00pm.
- Please consider the following criteria:
 - (1) Scientific understanding of the topic
 - (2) Preparation of the material

 mornkr@gmail.com (not shared) [Switch account](#) 

* Required

Please choose TWO students who you found have carried out the best term project research and made the best presentation material. (The names below gets automatically reshuffled every time in order to prevent any bias, so please use the "Search" function in your browser to find your choices.) *

- 송인영 / Physics of Dominos (도미노 역학)
- 차혁찬 / 그 때 '난장이가 쏘아올린 종이비행기'는 지금 어디 있을까?

Term Project Presentation (Jun. 9)

- **Drag and drop** your slides as images **by 23:00pm, May 31 (Sun)** on a shared Google document below:

<https://docs.google.com/presentation/d/17HFeWg4uImH6Z-aXDSWxQhRqoiKSGJgDXc89C2qHRRg>

The screenshot shows a Google Slides presentation editor. The browser address bar displays the URL: <https://docs.google.com/presentation/d/1WDKFsYAo0a42OzpZAp6urkgAY2rFX6uqJhAfLvp...>. The slide title is "Final Presentations: Slides". The main slide content is "Student Name: John Doe". The left sidebar shows a list of slides: 1. Student Name: John Doe, 2. LIGO Gravitational Wave Signals, 3. LIGO Gravitational Wave Signals, 4. LIGO Gravitational Wave Signals, 5. Student Name, and 6. The toolbar includes options for Background, Layout, Theme, and Transition.

The screenshot shows a Google Slides presentation editor. The browser address bar displays the URL: <https://docs.google.com/presentation/d/1WDKFsYAo0a42OzpZAp6urkgAY2rFX6uqJhAfLvp...>. The slide title is "Final Presentations: Slides". The main slide content is titled "LIGO Gravitational Wave Signals" and includes the following text:

- Signals from distant events that distorted the spacetime fabric.
- **A new window to the Universe** opened up in addition to the good old electromagnetic window.

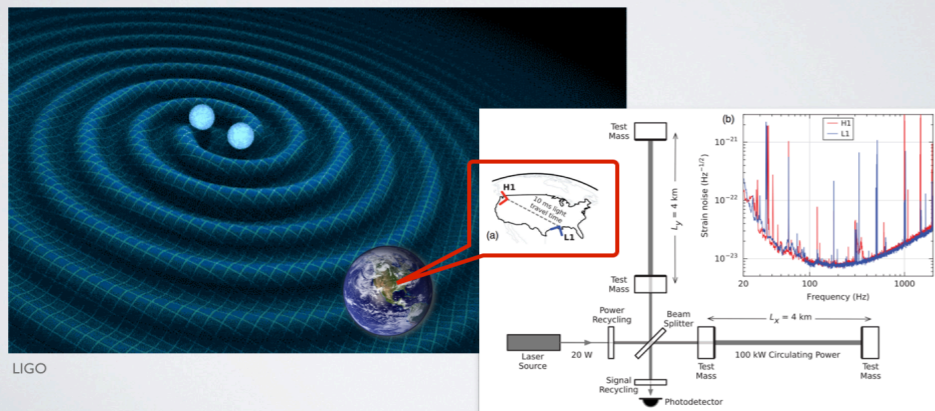
The slide features a diagram of a LIGO detector and a plot of strain rate versus frequency. The diagram shows a laser source (20 W) entering a beam splitter, which splits the beam into two paths. One path goes through a mirror and back, and the other path goes through a mirror and back. The beams recombine at the beam splitter and are detected by a photodetector. The diagram also shows a map of the United States with a red box indicating the location of the LIGO detector. The plot shows the strain rate (10⁻¹⁸) versus frequency (Hz) on a logarithmic scale. The plot shows a peak at approximately 350 Hz. The plot is labeled "Abbott et al. (2016a)" and "www.jihoonkim.org".

Term Project Presentation (Jun. 9)

- **10-min presentation (+1-min Q&A) with maximum 6-page slides** (including the title page) to present your term project.

LIGO Gravitational Wave Signals

- Signals from distant events that distorted the spacetime fabric.
- **A new window to the Universe** opened up in addition to the good old electromagnetic window.



Abbott et al. (2016a)

www.jihoonkim.org

Extra credit guideline

- **+2:** for volunteering for a presentation by submitting your slides before May 31 (even if we have too many volunteers you will get +2 just for submitting the slides).
- **Additional +2:** awarded to 2 students who were voted the best by your peers.

5-Minute Talk for Students in Conferences

Coffee break & poster session		15:20-15:40	
Observations of AGN Feedback (IV) Chair: Yingjie Peng	The most obscured galaxy nuclei – dusty AGNs and collimated molecular outflows	15:40-16:05	Susanne Aalto (remote)
	Observational Clues about Feedback in the Circumgalactic Medium of Massive Galaxies	16:05-16:30	Megan Donahue
	Mapping the Circumgalactic Medium Kinematics Through the Diffuse Emission	16:30-16:45	Zheng Cai
	Density diagnostics of ionized winds driven away from black holes	16:45-17:00	Junjie Mao (remote)
	The complex (negative and positive) AGN feedback from outflows and jets in the Teacup	17:00-17:15	Giacomo Venturi
	Outflows in AGN host galaxies from MaNGA	17:15-17:20	Kateryna Vovk
	The impact of AGN activity in nearby Seyfert galaxies: high resolution study of the multiphase ISM	17:20-17:25	Maria Vittoria Zanchettin
	Intermediate mass black hole feedback in dwarf galaxy simulations with a resolved interstellar medium and accurate nuclear stellar dynamics	17:25-17:30	Christian Partmann
AGN feedback in the early Universe	17:30-17:55	Roberto Maiolino (remote)	

3-Minute Thesis @ Caltech

3MT: Three Minute Thesis

The Three Minute Thesis competition challenges Caltech graduate students to explain their research in an engaging and clear three-minute talk intended for a non-specialist audience. Given Caltech's prominence in science and engineering communities, we feel it's important to give Caltech graduate students the opportunity to practice communicating their science in ways that will resonate and inspire.



▼ Current Events

On Display

3MT: Three Minute Thesis

Stress Free Finals Week

Virtual Library Week

Senior Thesis Prize

Open Access Week



Competition Information

Prizes

There will be four prizes awarded:

- **\$3,000** for first place
- **\$2,000** for second place
- **\$1,000** for third place
- **\$500** for the audience favorite as chosen by attendees

Key Dates

- **March 1, 2023:** Submissions Open
- **March 22, 2023:** Submissions Due
- **April 10, 2023:** Final Selection
- **April 25, 2023:** 3MT Competition

Sponsors

We are pleased to partner with Caltech Theater and Public Programming for the event. We also thank the following generous sponsors for making the competition possible.

Diamond Level

EBSCO
Information Services

I-Minute Lightning Talk @ Caltech

upcoming talks & seminars

TUESDAY

PHD Comics presents Oliver's Great Big Universe

5-6pm @ Cahill
with Jorge Cham

FRIDAY

High Energy Theory Seminar

11am-12pm

The classical equations of motion of quantised gauge theories with Tom Melia

TAPIR Seminar

2-3pm

Gaining Physical Insights into the Formation of Black-Hole Mergers with Monica Gallegos-Garcia

Geometry and Topology Seminar

4-5pm

Lee filtration structure of torus links, adjunction inequality, and applications with Qiuyu Ren

Stargazing Lecture

8-10pm

FARSIDE: Exploring the Cosmos from the Moon
with Nivedita Mahesh

[\(learn more\)](#)



4PM COLLOQUIA

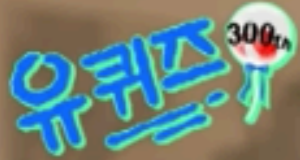


WEDNESDAY *astronomy*

"Lightning Talks"

We will have a series of lightning talks from incoming postdocs and research scientists. Each talk will be 1-2 minutes long and will introduce our incoming scientists to the local astronomy community.

15-Second Elevator Pitch



브로드웨이 관객 점유율 103%
토니상 6관왕을 휩쓴 박전휴 작가

tvN

엘리베이터 피치

엘리베이터를 타고 내려가는 10~15초 안에
작품에 대해 간단하게 요약 설명하는 것

Bounce It Off Grandma

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🔒 | RANDOM SAMPLES



Bounce It Off Grandma

SCIENCE • 31 Jan 2003 • Vol 299, Issue 5607 • p. 657 • [DOI: 10.1126/science.299.5607.657b](https://doi.org/10.1126/science.299.5607.657b)

↓ 2



“I don't think there is any concept that you can't make understandable to the educated lay public. I always tell my students and postdocs if you can't explain to your grandmother what you are doing, probably you don't understand it yourself properly.”

—Nobelist Günter Blobel

(in a conversation published in a Rockefeller University end-of-year publication)