

Gender in Physics

Benasque Science Center, 13 March 2025

1st UNDARK Scientific School on
Astrophysical and Cosmological Probes of BSM



Funded by
the European Union

Yossi Nir



מכון ויצמן למדע
WEIZMANN INSTITUTE OF SCIENCE

Plan of Talk

Introduction

Ghez and Genzel

Research

Postdoc database

Books

Unconscious bias

Introduction



The Faculty of Physics at WIS



Established in 1954



1954-2008: Not even one woman-PI



I joined the faculty in 1990; I was bothered by the absence of women



I was even more bothered by the fact that no one thought this is a problem

Collaborations



Meytal Eran Jona (WIS D&I)

Research, Activities, Workshops



Esthi Ranen (WIS)

Postdoc database, Data (IBS), Research



Daphna Carmeli (Haifa)

Research



Pauline Leonard (Southampton), Marika Taylor (Birmingham), GENERA, GenHET

Women in Physics: Why is it important?



Better Physics

- Pool of talent
- **Diversity**

Better Academy

- Organizational performance

Better Society

- Fairness

Ghez and Genzel



With Daphna Carmeli (Haifa University)



The Nobel Prize in Physics 2020

Reinhard Genzel

In keeping with the times, Reinhard Genzel was in the middle of a virtual conference when he was surprised by the call announcing, “This is Stockholm!” In this interview, he briefly summarises his 40-year effort to image the galactic centre, which began with his joining his “second father”, 1964 Nobel Laureate in Physics Charles Townes, as a postdoc in Berkeley. Genzel describes the new technological developments that allow him to sense the gravity of the supermassive black hole by observing the motion of the stars orbiting it with exquisite precision, and looks ahead to possible future tests of the theory of general relativity in the decades to come.

Andrea Ghez

“It’s a passion for the universe!” That’s how Andrea Ghez succinctly sums-up her motivation for becoming an astrophysicist in this conversation recorded after she heard the news of her Nobel Prize in a 2am call from Stockholm. As only the fourth female Nobel Laureate in Physics, she describes the prize as “An opportunity and a responsibility.” Celebrating diversity in science, Ghez reflects that “Seeing people who look like you, or are different from you, succeeding shows you that there’s an opportunity.” And regarding the ‘other’ team of her co-laureate, Reinhard Genzel, she concludes, “There’s nothing like competition to keep you going!”



The Nobel Prize in Physics 2020

Reinhard Genzel

- The 212th male Nobel Laureate in Physics
- Advancing researcher
- Positioned within a lineage of physicists (physicist father, advisor (Nobel!), Einstein)

Andrea Ghez

- The fourth female Nobel Laureate in Physics
- Teacher, wife, mother
- Situated within a living social context (students, team, mother, partner, two sons)

Research



Fatma Shanan

Research

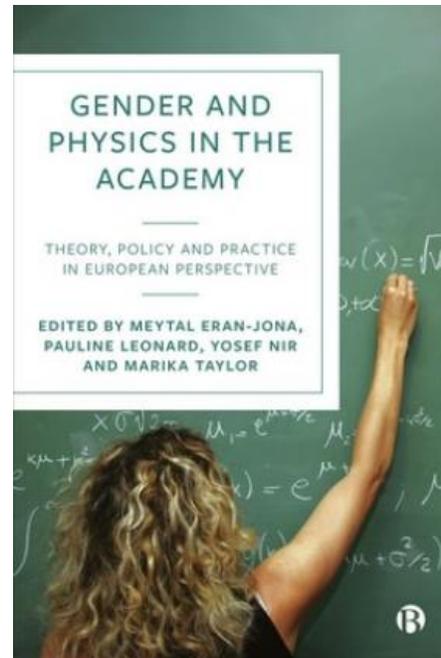
Ph.D. in physics as a hurdle race, and the “glass hurdles” for women

Meytal Eran-Jona^{1,a}, and Yosef Nir^{2,b1}

¹Feinberg Graduate School, Weizmann Institute of Science, Rehovot, Israel 7610001

²Department of Particle Physics and Astrophysics, Weizmann Institute of Science, Rehovot, Israel 7610001*

On their way to an academic career in physics, Ph.D. students have to overcome difficulties at many levels. Beyond the intellectual challenge, there are also psychological, social and economic barriers. We studied the difficulties experienced by physics Ph.D. students in the Israeli universities, with special attention to gender-related issues. Among the hurdles that are much more significant for women than for men – that we call “the glass hurdles” – we find gender-related discrimination, sexual harassment, physiological and psychological health issues, and challenges related to pregnancy and parenthood. We make recommendations for ways to confront and remove these barriers in order to provide female physicists with an equal opportunity to succeed.



PHYSICAL REVIEW PHYSICS EDUCATION RESEARCH **17**, 020101 (2021)

Choosing physics within a gendered power structure: The academic career in physics as a “deal”

Meytal Eran-Jona^{1,*} and Yosef Nir^{2,†}

¹Feinberg Graduate School, Weizmann Institute of Science, Rehovot, Israel 7610001

²Department of Particle Physics and Astrophysics, Weizmann Institute of Science, Rehovot, Israel 7610001

(Received 29 October 2020; accepted 14 June 2021; published 12 July 2021)

This research focuses on the absence of women among academic staff in physics. To explore the causes of this gender imbalance, we focus on the decision-making junction between obtaining a Ph.D. diploma and pursuing a postdoctoral position. We use the mixed-methods paradigm, combining a nationwide representative survey of Ph.D. students in Israel ($n = 267$ respondents out of 404 questioned) and interviews with Ph.D. students and postdoctoral fellows ($n = 38$). The theoretical novelty that we propose is to view such career decision making as a “deal” that involves contextual, organizational, and individual variables and their intersection. Young women are examining the components of this deal: what it offers them and what prices they will have to pay, but their decision is made within a gendered power structure. Studying both context factors and agency, we reveal the multiple hidden ways in which gender operates as a power structure, putting up barriers to women’s academic careers. This latent power structure influences women’s decision making and experiences in several ways. In the academic field, it produces unequal competition in a male-dominated playground. In the social sphere, choosing a demanding academic career is seen as disrupting gender order. Within the family, women carry a greater burden of family work and give precedence to their husband’s career and preferences. Within this social structure, women who decide to follow an academic career feel that they must excel, and this demand for “excellence” acts as a hidden mechanism within the gendered power structure that may prevent talented women from pursuing an academic career in physics.

With Meytal Eran Jona (Weizmann Institute D&I)

PhD and Postdoc in Physics

In collaboration with Meytal Eran Jona, sociologist and gender expert

Survey among B.Sc. And M.Sc. students

Survey among Ph.D. students

Interviews: Female Ph.D. students, Postdoc, PI's

Economic model of postdoc

Ph.D. in physics as a hurdle race...

Survey: All physics PhD students in six research universities

Respondents: 267/404 (66%); Women students: 60/64 (94%)

Professional difficulties

- Physics studies are difficult, intensive, frustrating
- Competitive environment
- Success strongly depends on the PhD advisor

Economic difficulties

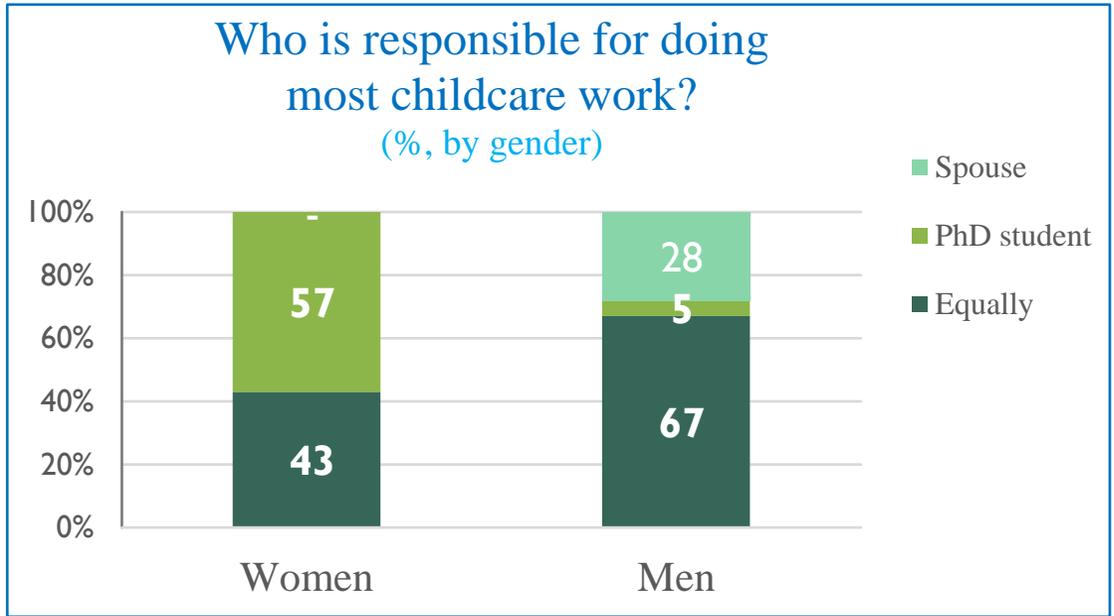
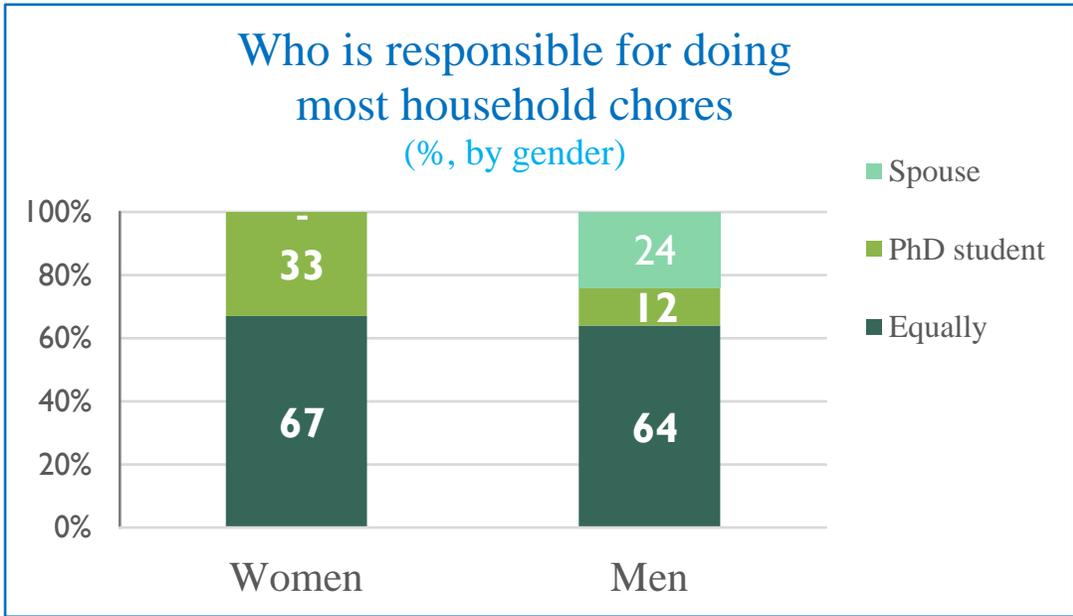
- Low fellowship, no social benefits
- Difficult to provide for a family
- Significant job insecurity

Personal difficulties

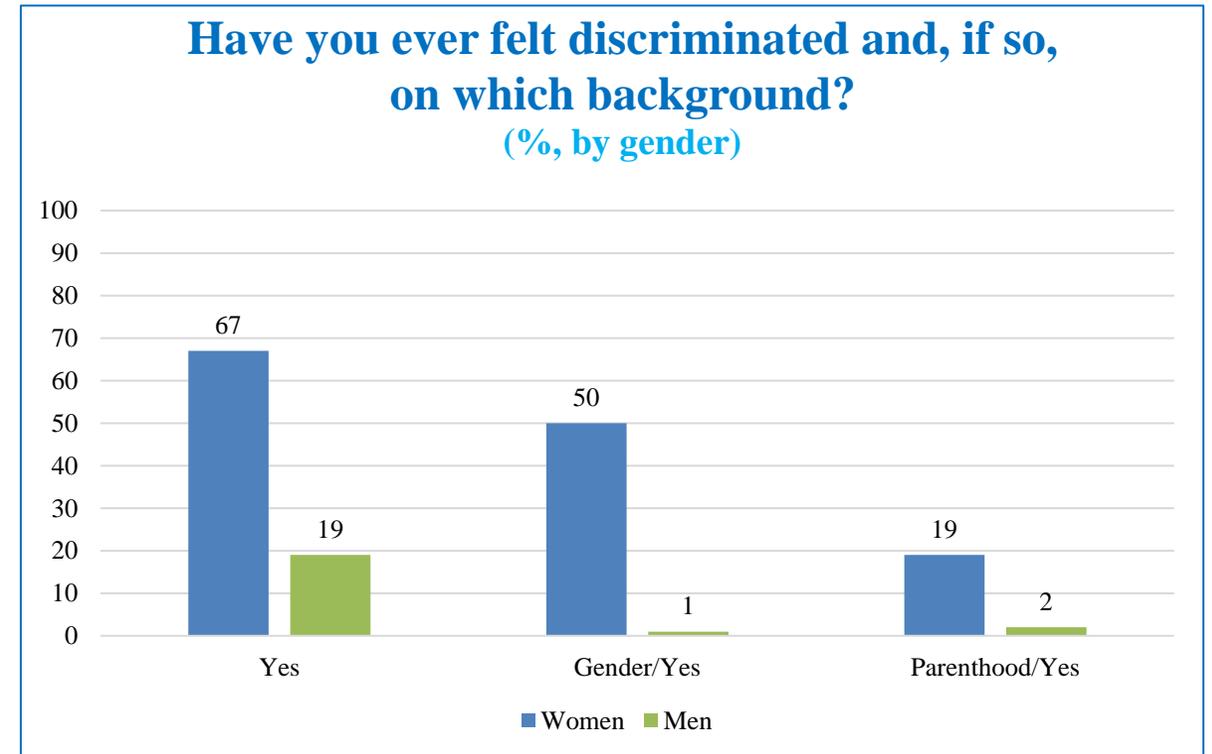
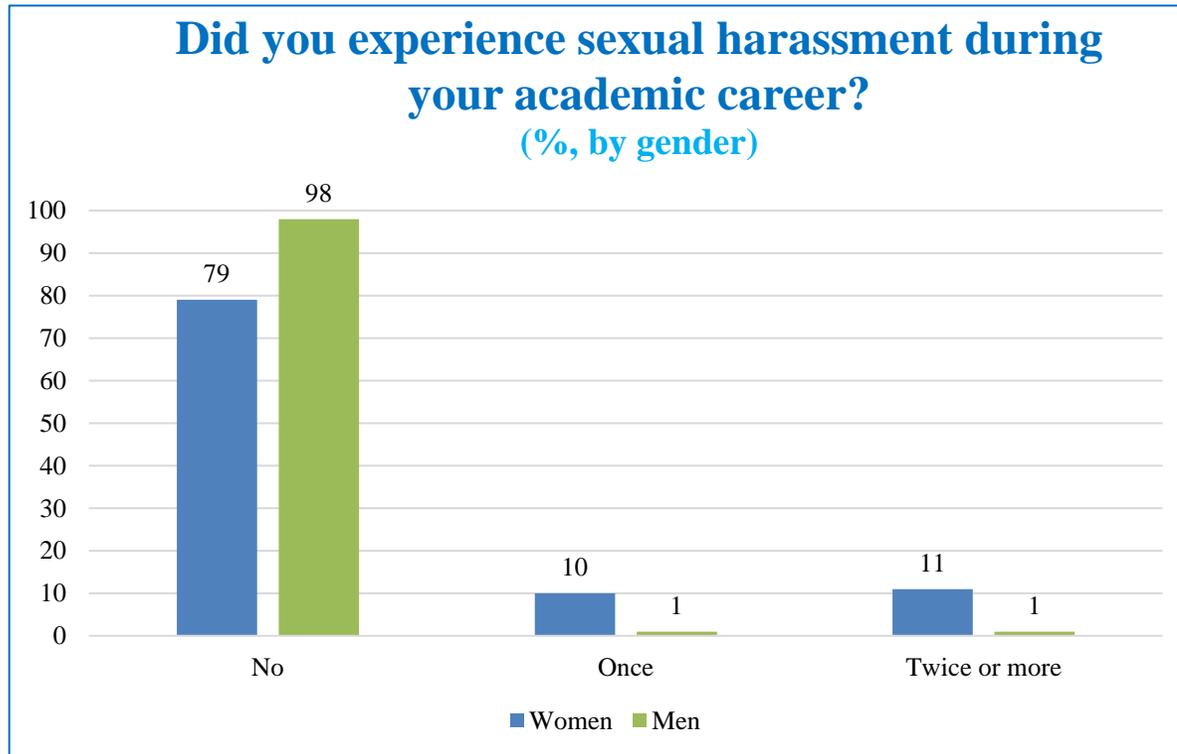
- Loneliness, uncertainties, emotional difficulties

...and the “glass hurdles” for women (1)

Length of parental leave
66% of men: a week or less
69% of women: 4 months or more



...and the “glass hurdles” for women (2)



Postdoc as a deal: Pluses

Scientific research in an exciting field

Intellectual freedom to be creative and discover

Independence in choosing topics and ways of research

No boss, no clients

Occupational confidence

Chances of breakthrough discoveries (and the accompanying glory), prestige

Postdoc as a deal: Minuses

On the personal and family level

- New country, new language, new social, cultural and educational system

On the professional level

- Finding an academic host, need to prove oneself again, to publish, to show independence, all this without certainty on future academic position

On the economic level

- Fellowship, often not enough to support a family

Postdoc as a deal: Gendered aspects

Unequal competition in physics as a masculine field

Prioritizing family and husband's career

Postdoctoral career as a disruption of the gender order

Self-expectations for excellence

Unequal competition in a masculine field

Struggle to succeed as physicists and as mothers

Viewed as less devoted workers because of their parental commitment

Feel discriminated on the gender background

Sexual harassment

Family considerations and spouse's career

How central is this consideration in your decision whether to go abroad for a postdoc?

Men (%)	Women (%)	
89	95	Spouse's employment possibilities
84	93	Spouse and family relocation
78	90	Putting the spouse's career on hold

Compare your spouse's income to yours

Men (%)	Women (%)	
28	67	Higher than mine
20	22	Similar to mine
46	11	Lower than mine
6	0	Has no income

Disruption of the gender order

The social and family environment perceives postdoctoral studies as an ambitious and non-normative path for women

Common for women to follow their spouses for a period of work or studies abroad, but the opposite model is still considered non-normative and “feminist”

“Even if the husband is supportive, the extended family wrinkle up their noses and put pressure on me. If it were possible to do a postdoc in Israel, it would be much easier for women.”

Affects even single women with no children (concern of impairing their chances to get married or that it may limit a future spouse’s career)

Self-expectations for excellence

When women compete over an academic career in a masculine field, they

- Have to overcome gender discrimination and the motherhood penalty
- Prioritize their husband's career at home
- Take a greater share of the childcare

What justifies their decision to go on a postdoc abroad?

Excellence!

- Academic achievements
- The supervisor evaluation
- The professional group perception of the academic potential
- The ability to receive a postdoctoral offer from a top institute

Excellence

In the public sphere

- Allows the student feel worthy to face professional competition from their male colleagues

In the private sphere

- Justifies (to the spouses and to the women themselves) their choice of non-normative career path for a woman, which includes going abroad for a postdoc and subordinating the family to her career needs

Postdoc database



With Esthi Ranen (Weizmann Institute)

Female Postdoc Database

Database of Israeli female physicist postdocs

- Contact details
- CV
- List of publications

Personal communication with each, every 6 months

- What's new?
- CV and LoP updates
- Plan to visit Israel?

Goals

We must not miss a worthy candidate

We show that we care

We advise (mentorship)

We help (sponsorship)

In some cases, we actively intervene (micro-intervention)

Invite and help with travel expenses when visiting Israel

Collecting statistical data: 2015-2024

10 years - 52 women postdocs

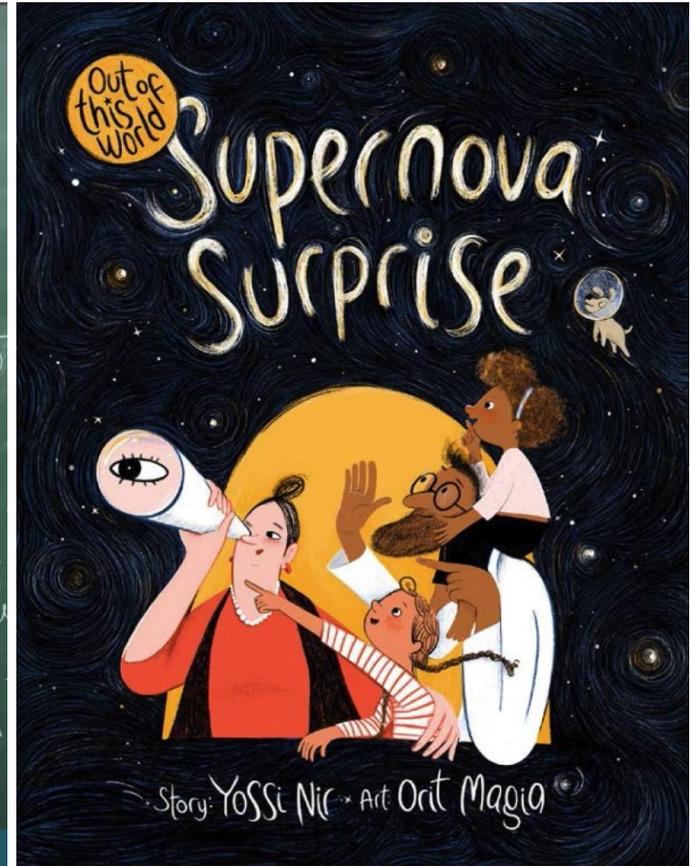
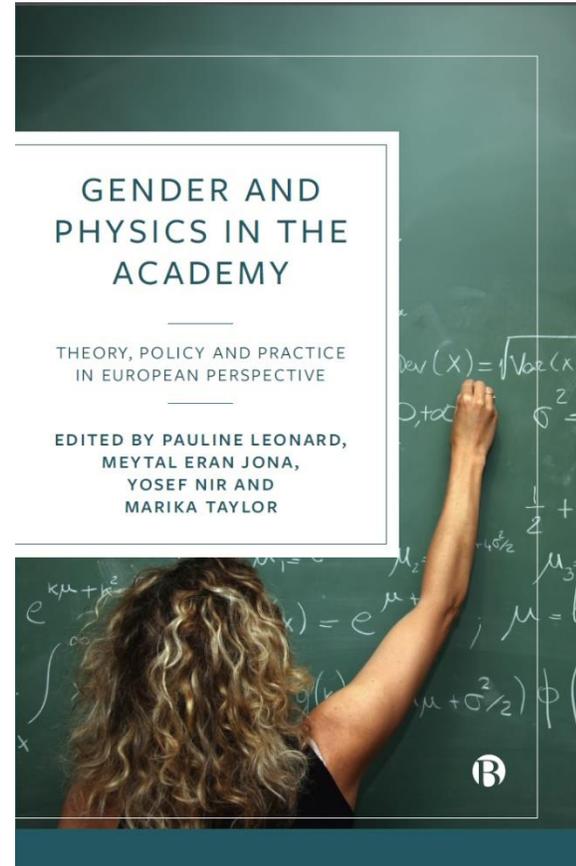
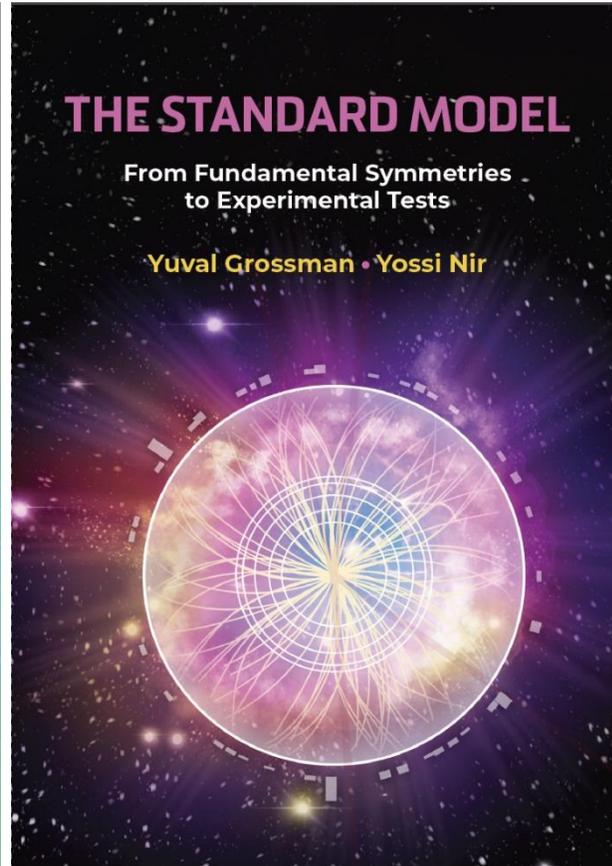
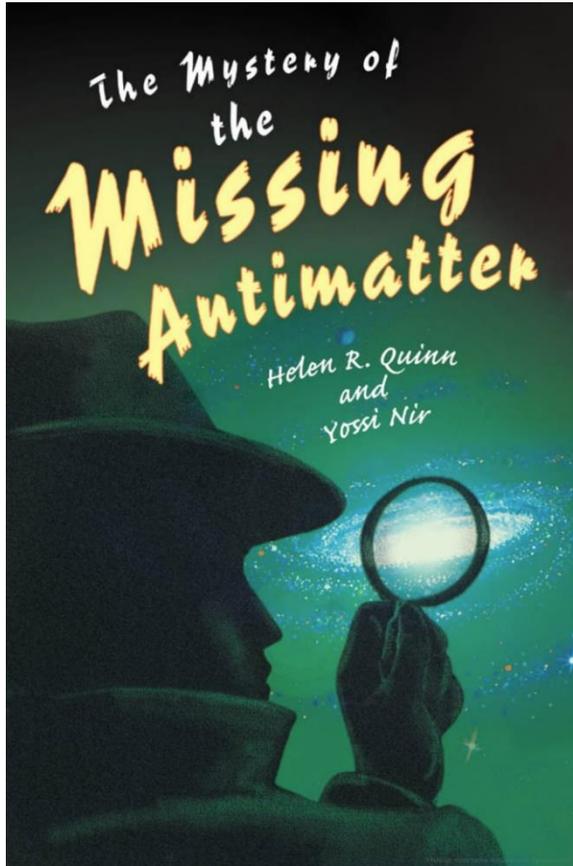
Currently - 19

Of the 33 that finished: 25 in academy, 8 in private sector

- 4 abroad
- 1 staff scientist
- 2 tenured

Success rate of 76%

BOOKS



Supernovae, Comets, Black Holes

Right after Mom and Dad left for the airport, Omer and Grandpa sat down to play chess, and Omer trapped Grandpa with a Scholar's Mate.



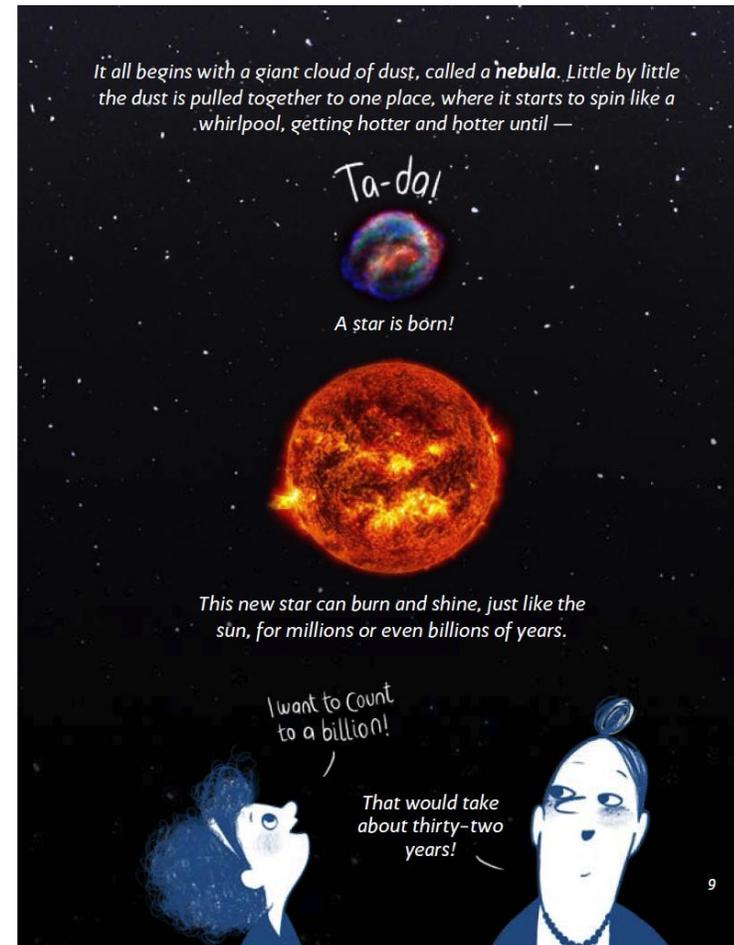
Then Grandpa asked Rom to help him prepare dinner, but she said **no** because Mom and Dad never needed help.

Suddenly, the egg that Grandpa was cooking *exploded!!*

Supernovae, Comets, Black Holes



8



9

Supernovae, Comets, Black Holes

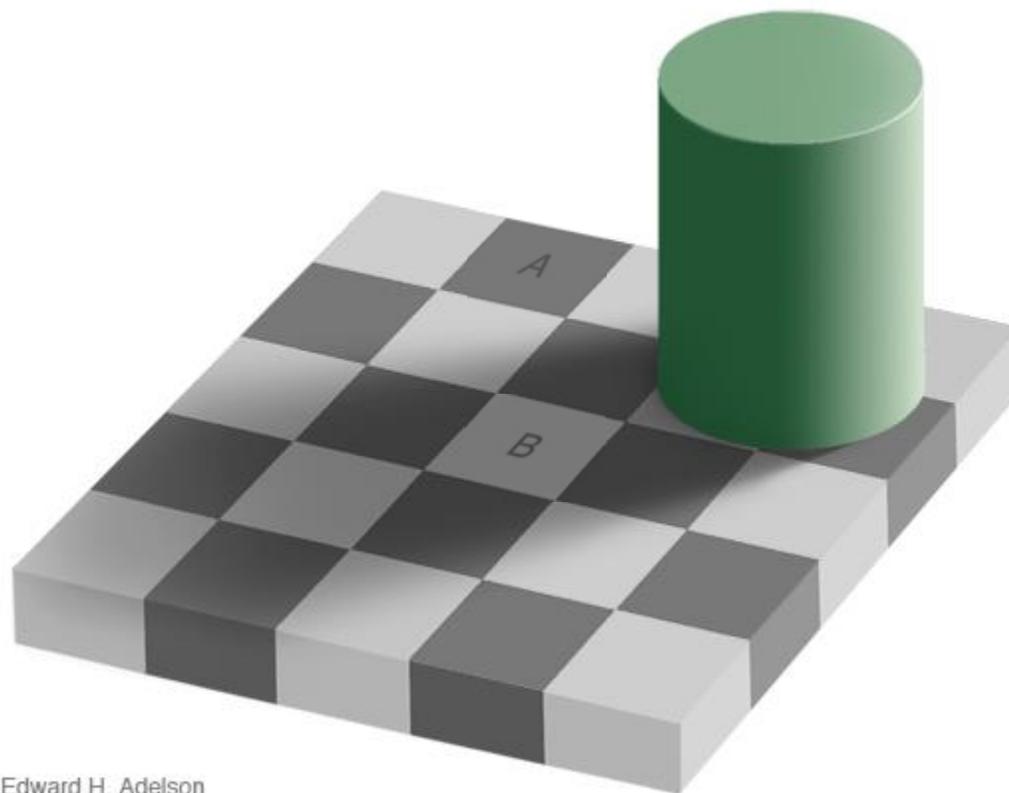


Unconscious Bias



Meytal's talk tomorrow

The physicist that was there



Edward H. Adelson

Summary

There is gender imbalance in physics in the academy

We will benefit if we fix the situation

There is no silver bullet solution

There is a variety of ways to achieve the goal

You can contribute