





Adventures in physics and in Hollywood

**Lena Murchikova
Groce Fellow
Caltech**



Questions:

- Your family (parents, siblings, and others close to you) and their role(s), if any, in technology,
- Your education and how you became interested in science.
- How Russian university and graduate schools differ from what you are now observing in the USA.
- What are the requirements for a Ph.D. (or other advanced degree).
- What sort of advisor(s) did you have?
- What was your thesis topic in theoretical physics? In simple words, what did it solve?
- How did you decide to come to the USA? To Caltech? To astronomy?
- Comparison of Caltech and Moscow State University.
- What are your plans at Caltech? Observational or theoretical? Your advisor?
- Have you collaborated with or travelled to other technical institutions?
- What did your parents think about what you are doing?
- How was it to work with Kip Thorne and "Hollywood?"
- Summary of where you came from? And where are you going?



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Family:

Valentina Murchikova (Moscow)
self taught accountant and economist
Head of the department of
meat production planning for USSR

Vasily Murchikov (Moscow Region)
High skilled construction worker

Col. Petr Mileyko (Belarus)
Military man
Construction division

Vera Mileyko (Belarus)
Housewife



Mikhail Murchikov (father)
(Moscow)
The head of
the apartment complex
(with 500 apartments)
Aerospace engineer by education



Tatiana Mileyko (mother)
(Belarus)
Administrator for municipal district
Electrical engineer by education

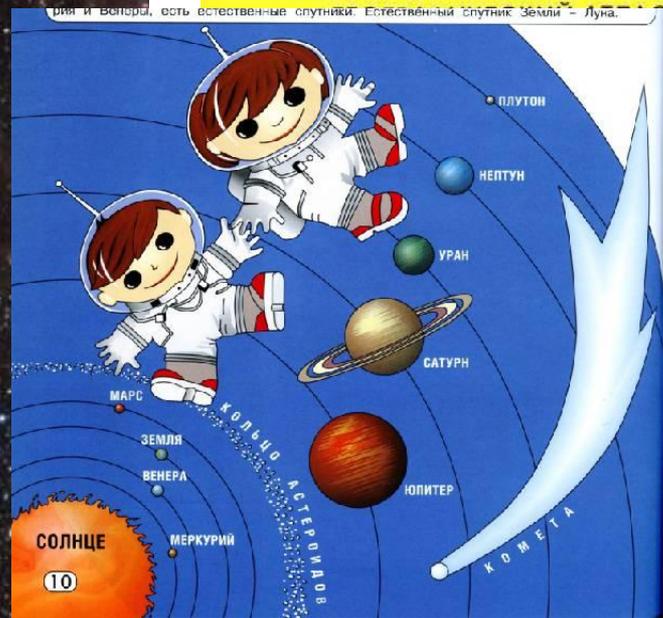
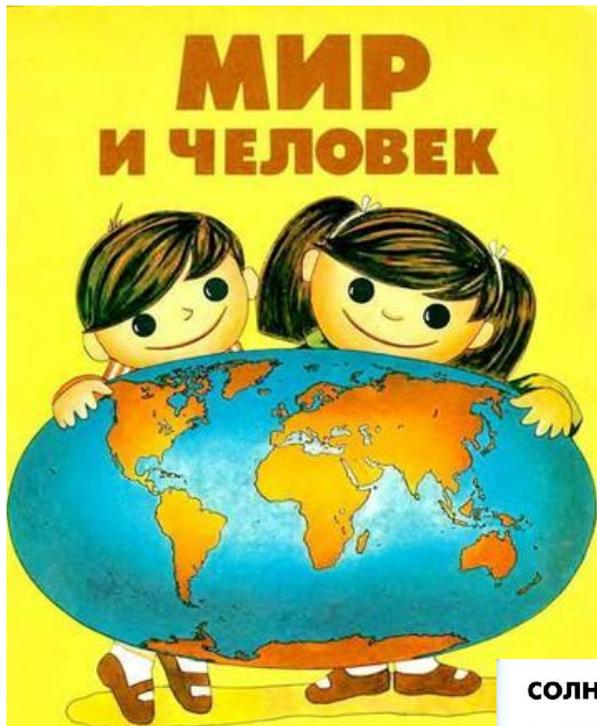


Tatiana Murchikova (aunt)
Design engineer. Radioelectronics

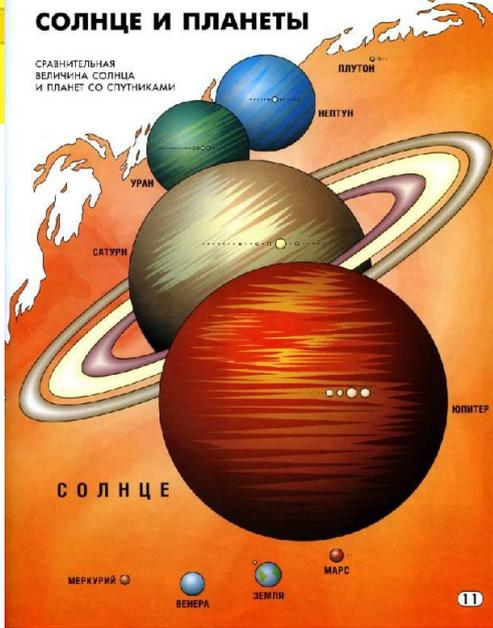




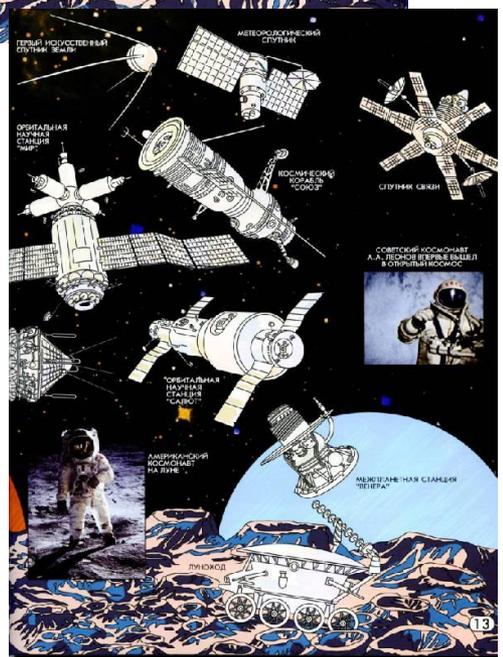
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Russian education system is different

- no private schools
 - 10 years
 - education is free at schools and (most) universities
 - ordinary state schools + specialized schools with entrance examinations
 - entrance examinations in person to universities
 - only One university to apply
 - paying for education = not smart enough to study for free
 - no changing of major. It is fixed by entrance examinations.
(astronomy and physics are different majors)
-
- competition is highly encouraged
 - grades are publicly announced



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There no worse feedback than purely positive feedback.

Till 7th grade
ordinary school



From 8th grade
math school





First Teacher
Valentina Aleekseerva Balabanova



High school
Irina Alekseevna
Shaykina



Middle school
Tatiana Sergeevna Kapitonova

Only two top schools in science in the country:



Moscow State University



Moscow Institute of
Physics and Technology



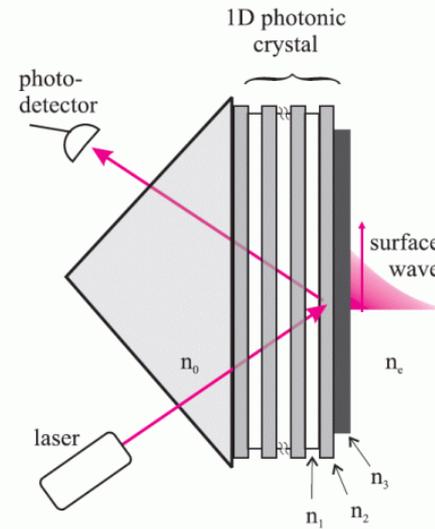


My Advisors:

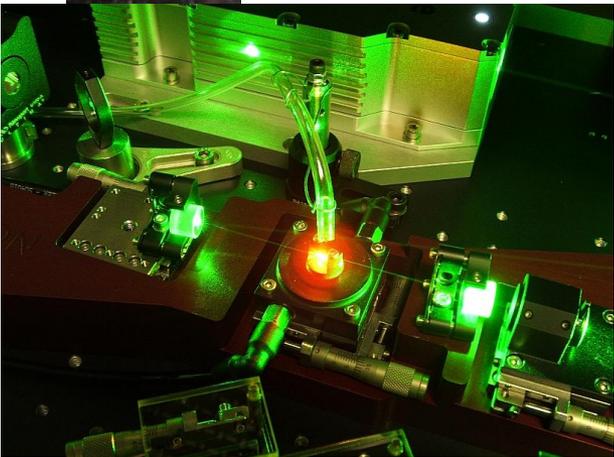
Oleg Aktsipetrov
laser physics



Andrey Fedyanin
quantum electronics

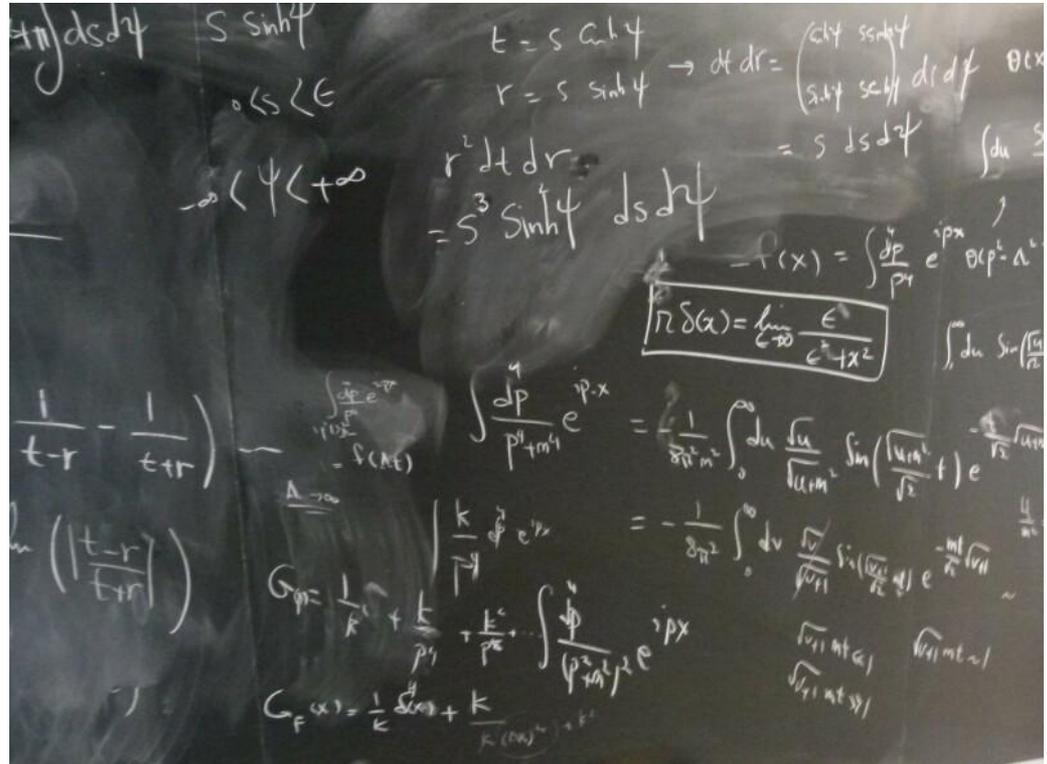


Dmitri Khokhlov
low temperature physics





Andrey Lobanov
Theoretical Physics



Elementary particle interaction in theories with broken Lorentz symmetry

Neutrino spin oscillations.

Full description as massive relativistic particle.

After graduation:

Junior research fellow in Moscow State University

with salary of 40\$ / month (after taxes)

Research fellow in London Imperial College



I had an office with my own chair, desk and computer!





I realized that the level of my thesis was ...
... not as high as I would want to.

To get a kandidat nauk degree from Moscow State University
one had to publish 2 papers.



Arkady Tseytlin
string theory





Arkady Tseytlin
string theory



Classical string solutions in $\text{AdS}_5 \times \text{S}^5$

E. M. Murchikova*

*Blackett Laboratory, Imperial College, London SW7 2AZ, United Kingdom
SINP, Moscow State University, 119991, Moscow, Russia*

Splitting of folded strings in AdS_3

E. M. Murchikova*

*Blackett Laboratory, Imperial College, London SW7 2AZ, U.K.
and SINP, Moscow State University, Moscow, 119991, Russia*

On nonlinear classical electrodynamics with an axionic term

E M Murchikova

Blackett Laboratory, Imperial College, Prince Consort Road, London SW7 2AZ, UK
and
Skobeltsyn Institute, Moscow State University, Moscow 119991, Russia

E-mail: e.murchikova@imperial.ac.uk



It was beautiful math, but no application to the real world. It did not feel like I was doing useful things.



I applied that year for a research
fellowships to continue working in
string theory and for 3 PhD programs,
and got offered all.

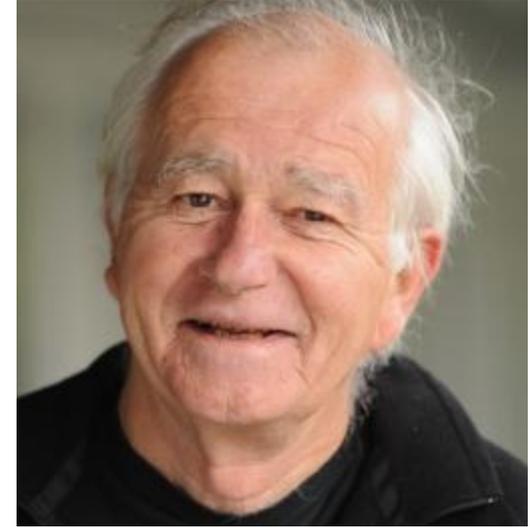
Refused the fellowship and moved to
Caltech.



Phil Hopkins



Christian Ott



Nick Scoville

Simulations

Observations

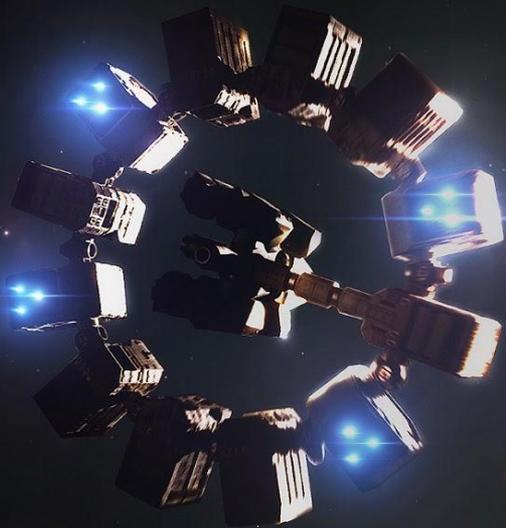
Another wonderful person



Kip Thorne



It's all started with
a notebook



They liked it and
they wanted
me on set

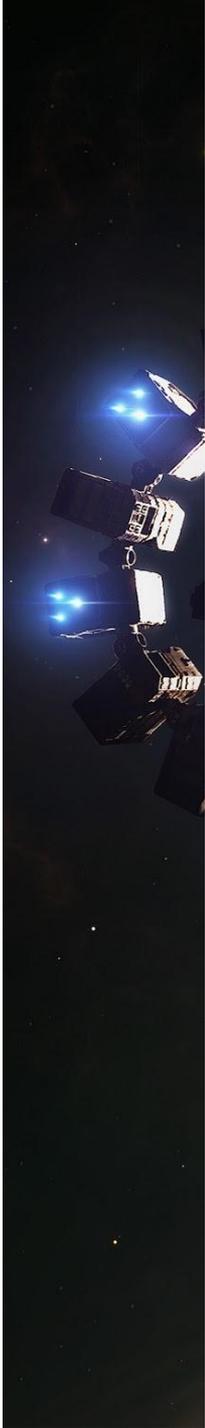


To help the property master with physics related props
an the Murph character



What I discovered about the movie people during my 2 days on set

- actor's job is very hard
- they are very friendly
- they work super efficient and inefficient
at the same time
- the sets are real
- they are... fascinated by scientists



To conclude





What I want to do at Caltech

to work on theoretical and observational sides
but more on theoretical



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they seems to be happy
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Where am I going?

Hopefully in the direction which can help a little with
understanding and harnessing gravity, which will
let humanity go to the stars

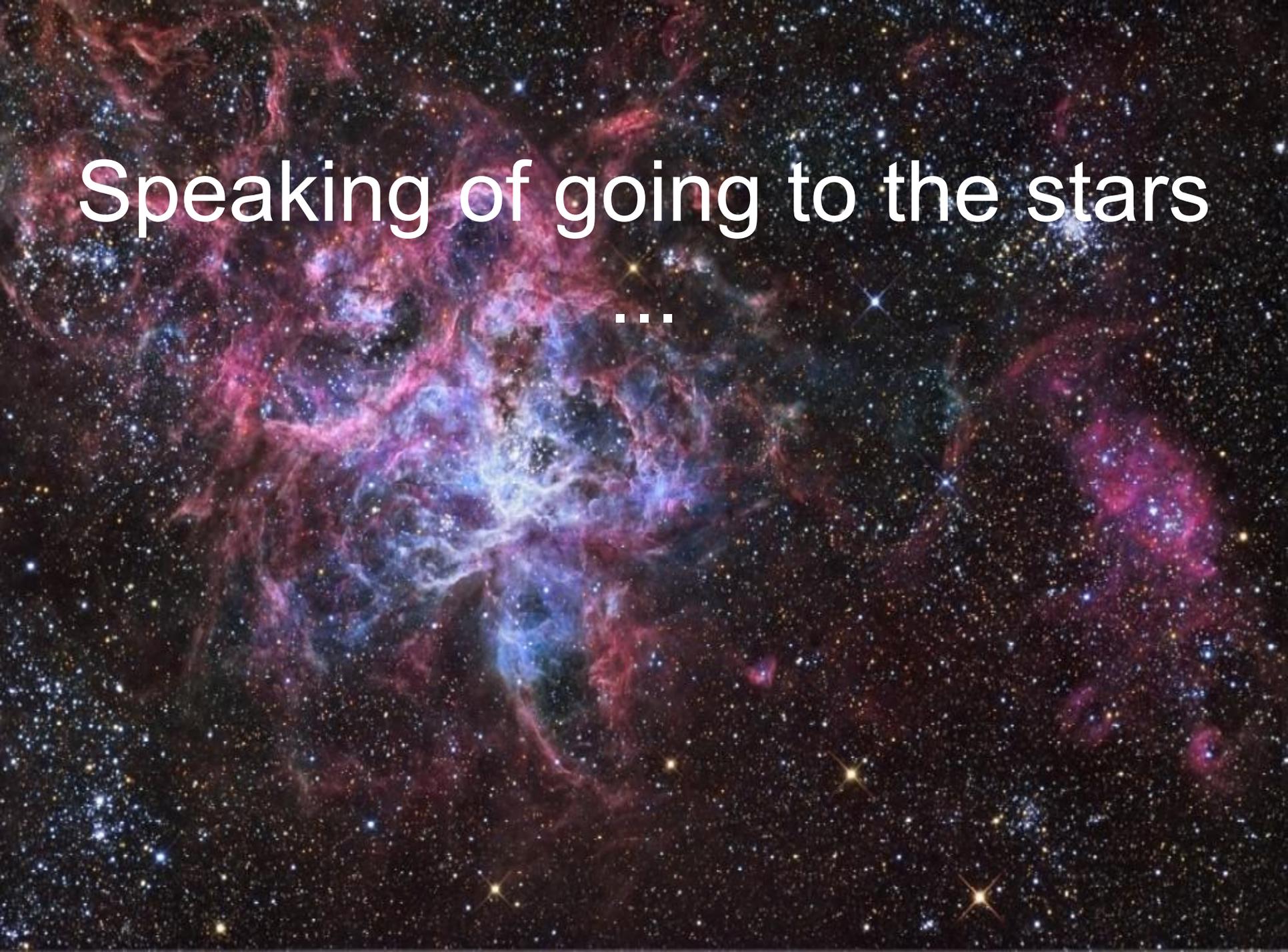


A vibrant, multi-colored nebula with red, blue, and purple filaments against a starry black background. The text "Thank you!" is centered in white.

Thank you!

Speaking of going to the stars

...





I would like to thank

David and Barbara Groce
for their invitation to speak here,
their kindness,
their support of me as Groce fellow,
our Theoretical Astrophysics group
and Caltech for many years.



I had a great privilege of
helping Kip Thorne
with making props for the movie
Interstellar
and spend 2 days on set as an
adviser.



Natalia Romanova
Twice World Champion
ice dancing

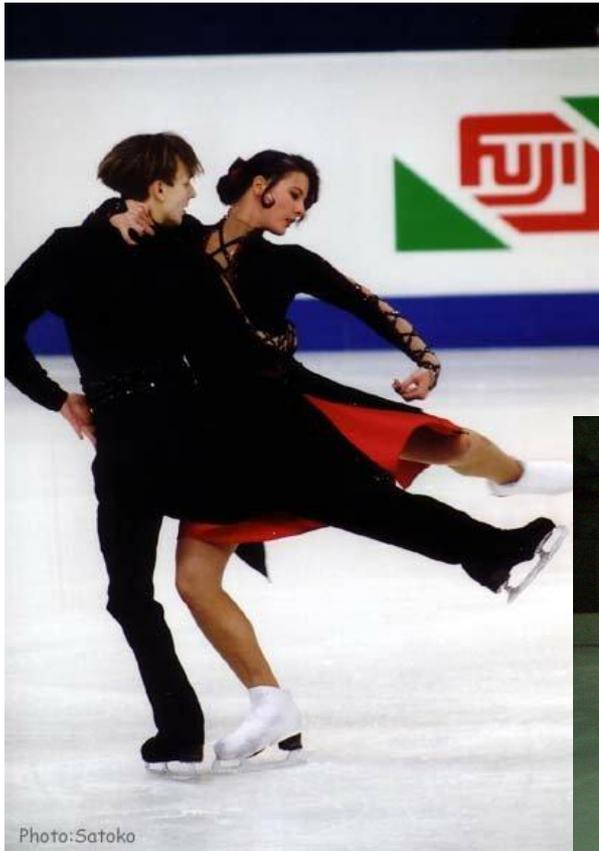


Photo: Satoko

Natalia Romanova
Twice World Champion
ice dancing





Natalia Romanova
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Tatiana Tarasova
figure skating coach
7 Olympic Gold medals,
41 European and World Gold medals