

UiO : **Fysisk institutt**

Det matematisk-naturvitenskapelige fakultet

Welcome to the Master Programmes at the Department of Physics



Johannes Skaar
Fysisk institutt, UiO
johannes.skaar@fys.uio.no

We are glad that you are here!!!

You are important for the University!

- social environment
- you contribute to research
- when you ask questions, you learn and we learn

Oldest university in Norway

- Founded in 1811
- 28000 students
- 6600 employees
- 3800 scientific employees
- budget: 7.8 GNOK

8 faculties:

- Fakultet of Humanities
- Faculty of Law
- Faculty of Mathematics and Natural Sciences
- Faculty of Medicine
- Faculty of Dentistry
- Faculty of Social Sciences
- Faculty of Theology
- Faculty of Educational Sciences

Faculty for Mathematics and Natural Sciences

- Department of Biosciences
- School of Pharmacy
- Institute of Theoretical Astrophysics
- Department of Physics
- Department of Informatics
- Department of Geosciences
- Department of Chemistry
- Department of Mathematics
- Department of Technology Systems

Research at the Department of Physics

Research groups:

- Biophysics and medical physics
- Electronics
- Semiconductor physics
- High-energy physics
- Nuclear physics
- Condensed matter physics
- Plasma and space physics
- Physics education
- Structure physics
- Theoretical physics

Clean room at NiNaLab



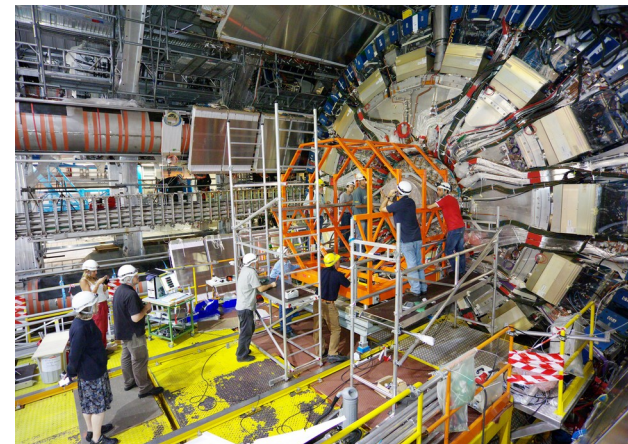
Oslo Cyclotron Laboratory



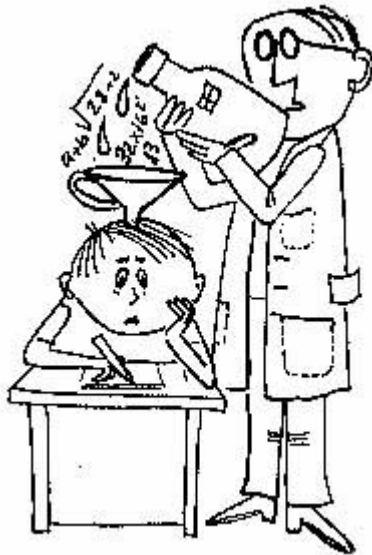
Rocket launch at Svalbard



ATLAS at CERN



We want you to succeed!



We are here to help you

- but **you** have to do the work!

Bachelor

build the foundation

broad

learn study techniques

Master

specialize

deep

your learning:

- more choices
- more freedom
- more responsibility

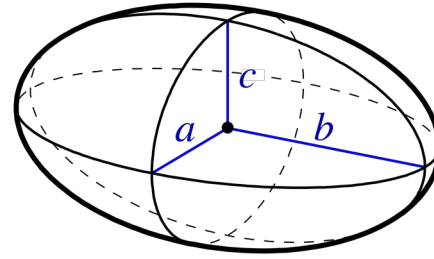
we expect you to be
much more independent

Some advice...

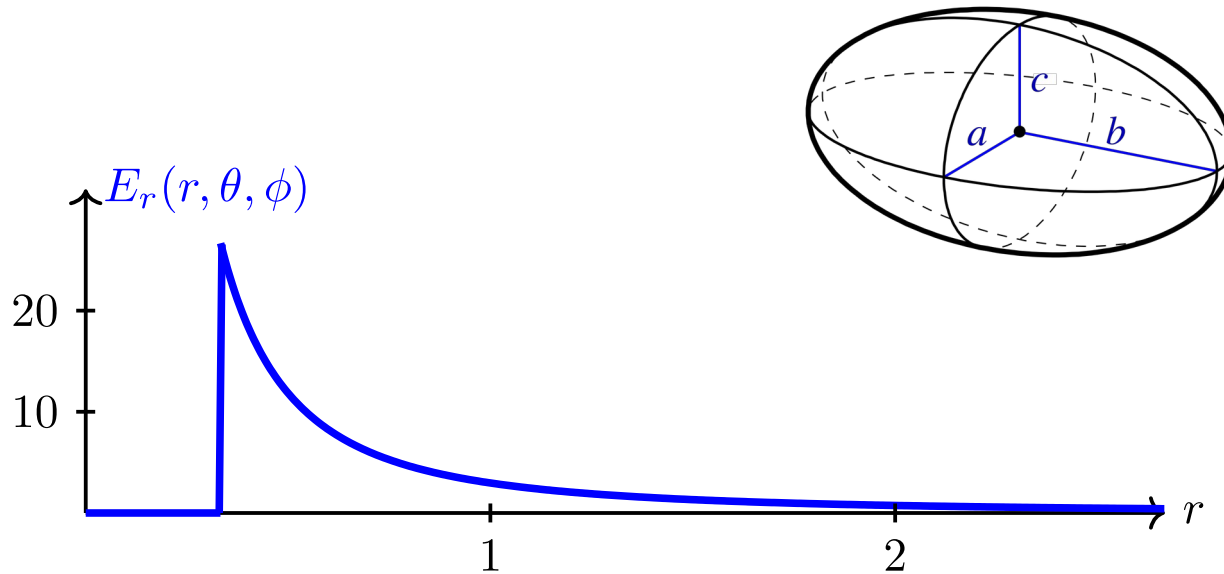
So far: Problems with known solutions.

In research there is no solution manual...

A charged, conducting ellipsoid:

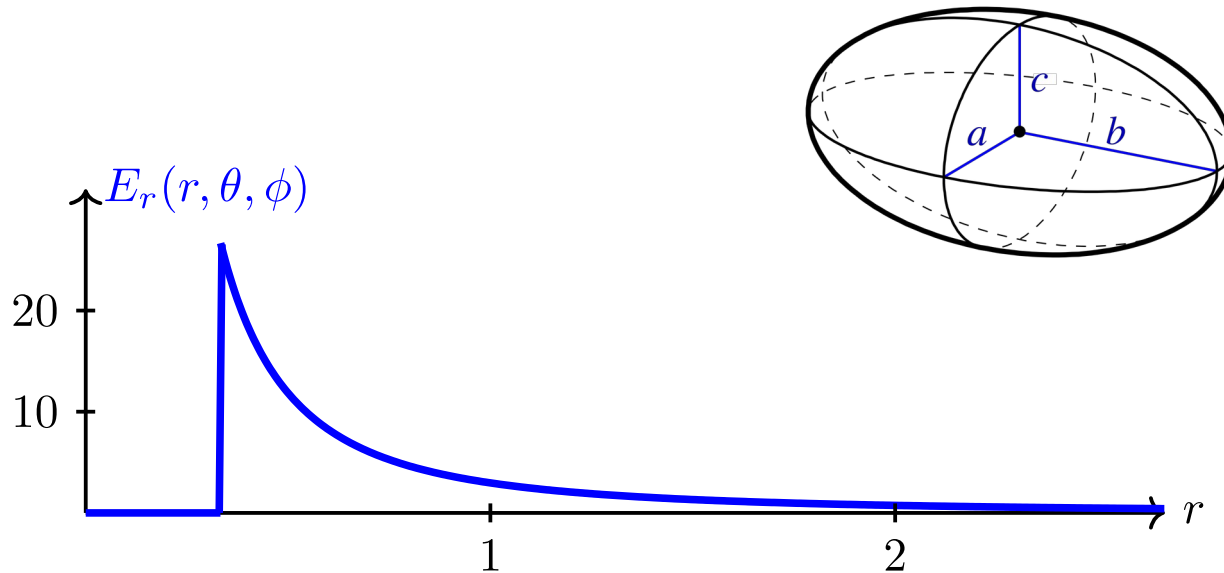


A charged, conducting ellipsoid:



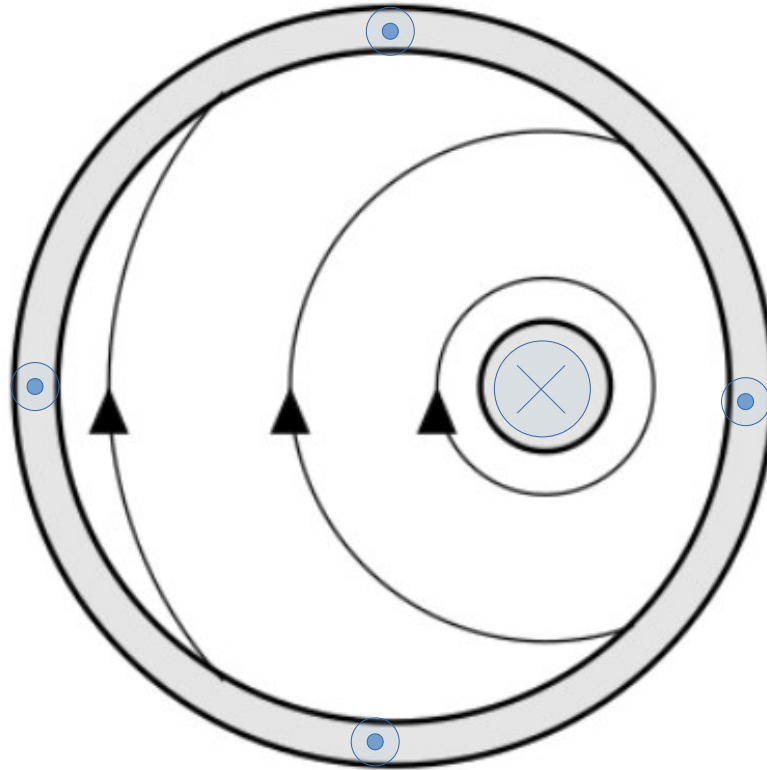
Does the result make sense?

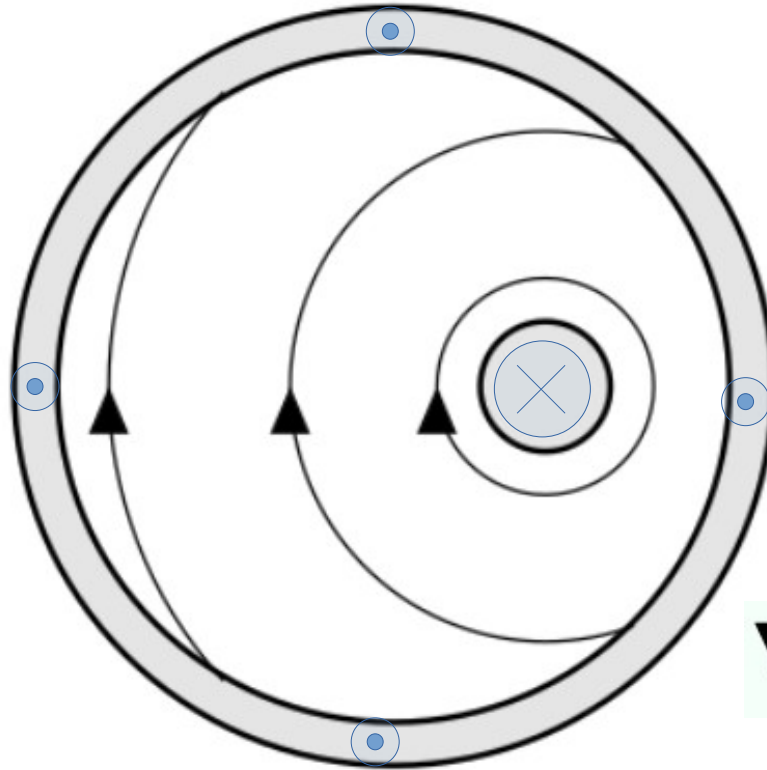
A charged, conducting ellipsoid:



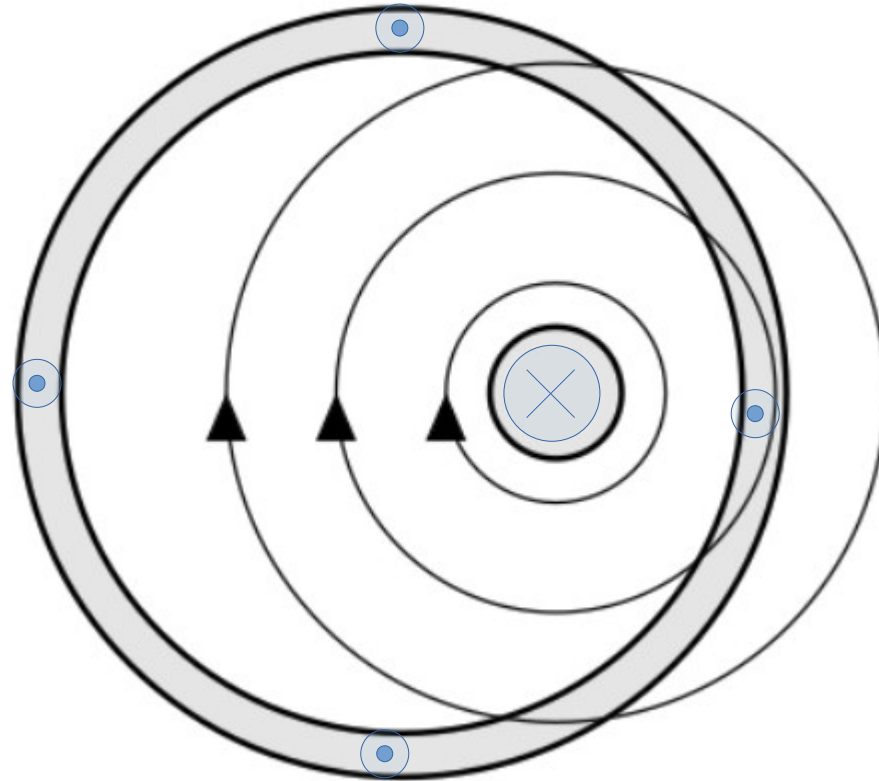
Tests:

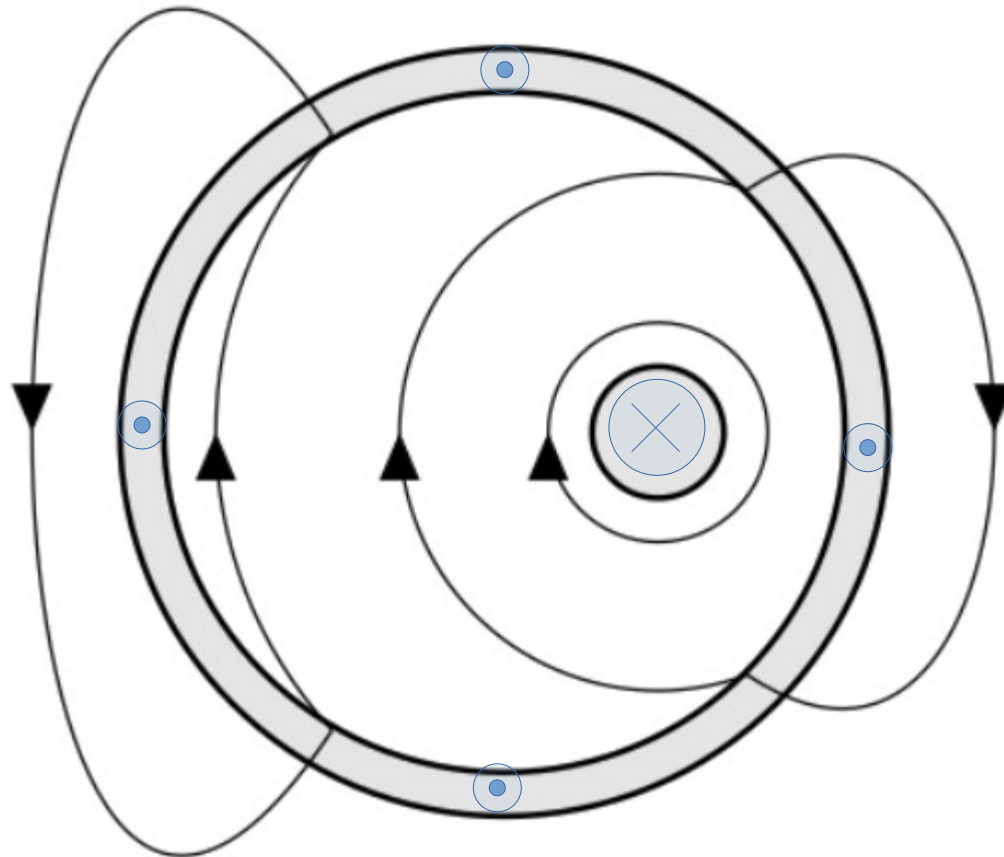
- put $c = b = a$, compare with analytical result
- check the asymptotic behavior as $r \rightarrow \infty$
- verify that $E = 0$ inside the conductor
- check if Gauss' law is satisfied
- ...?



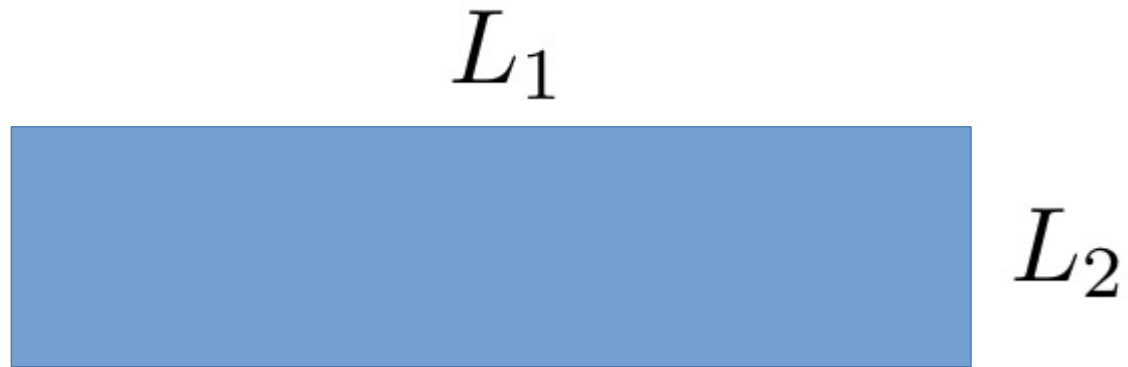


$$\nabla \cdot \mathbf{B} = 0$$





Formulas:



$$S = \frac{1 - L_1}{L_2}$$

Check if your results make sense!

Consider special cases...

Limits...

Dimensions...

Obey physical laws, boundary conditions?

...

Be creative... find ways to test your solution.

In programming: Isolate the bug!

Planning

plan your **course work / curriculum**

- lots of choices even within your specialization
- discuss your choices with your supervisor
- get advice from older MSc and PhD students in the group

plan your **research work**

- **YOU** are the **project manager** of your research work
- if possible, make a plan of the different tasks
- get help from your supervisor
- don't underestimate the time it takes to write your thesis

Talk

- talk to your supervisor
- talk to PhD students, researchers, other professors in your group
- talk to your fellow students
- talk to the student administration
- explain your research to your non-physicist friends

**communication is a very important skill –
in science and in general**

Writing

For experimentalists: Keep a lab journal!

For theorists: Write what you learn in a work document from day one!

For all: Start writing your thesis already in September 2022!

Being part of a research environment

your group is like a **family!**

it is also a fantastic **resource** – use it! Be inspired !

be **active!**

be **social!**

be part of the research environment

it is up to you to make it even better!

support others – and others will support you

talk about your research with others

keep yourself updated about your field of research:

- go to seminars
- go to MSc and PhD presentations
- read relevant articles

You have learned basic physics,
math, programming... during your BSc

now you get to the fun part: research !

There will be setbacks:

- experiments will fail
- computer codes will crash
- theories will not add up

Don't let this demotivate you –
it's part of the game.

Enjoy this experience !