Welcome to
AST3220 – Cosmology I

Who is teaching?

- Øystein Elgarøy, oystein.elgaroy@astro.uio.no
- Jakob Borg, jakob.borg@astro.uio.no
- Lectures (ØE): Monday 14:15-16:00
  Wednesday 12:15-14:00
- Problem sessions (JB): Wednesday 14:15-16:00, starting on January 24 in room 304 in Svein Rosselands hus (ITA)

Where to find information

- I will use the course webpage:
- https://www.uio.no/studier/emner/matnat/astro/AST3220/v24/index.html
- Topics for the week's lectures and problems for the problem sessions can be found under "Timeplan"
- Check this page several times every week!

What will you learn in this course?

- The equations governing homogeneous and isotropic universe models, and some of their solutions.

- Important phases in the history of the Universe (synthesis of light elements, origin of the CMB,…)

- Inflation: Why and what, and its importance as the origin of cosmic structures

What you should know

- I will assume that you have a knowledge of physics and mathematics corresponding to what you should have after five terms on the FA bachelor programme.

- More specifically, I will assume that you have taken introductory courses on mechanics, electromagnetism, quantum mechanics and statistical physics.

- Some knowledge of numerical methods and programming, sine the projects will be partly numerical. You can use any programming language you want. Matlab, Mathematica etc. are also OK.

A presumption of interest

- I will also assume that you are on this course because you are interested in cosmology

- Among other things, this means that I expect you to work on the weekly assigned problems, even though you don't have to in order to pass

- Some of the weekly problems pursue interesting topics not covered in the lectures

Syllabus

- My lecture notes, can be found on the course webpage

- Exercises

- In practice: Anything you need to know/know how to do in order to solve the problems in the projects

- If you want a supplementary book:

- B. Ryden: "Introduction to cosmology" (2nd edition, in some places more elementary than this course)

- S. Weinberg: "Cosmology" (above the level of this course, but a useful reference to have in your library)

Chatbots and AI

- It is strictly forbidden to use AI in any way on the projects

- You can, however, work together.

- Also, Jakob and I are fairly liberal with hints and suggestions

How is your grade determined?

- Three projects (dates TBA, will coordinate with AST3310 and take your wishes into account). The first is available on the course web page

- The projects are a mix of analytical and numerical (mainly) problems

- The first two contribute 25% each, the final one 50% towards your final grade

- You can write your projects in Norwegian, Danish, Swedish or English

What is cosmology?

- Cosmology is the study of the whole Universe as a physical system
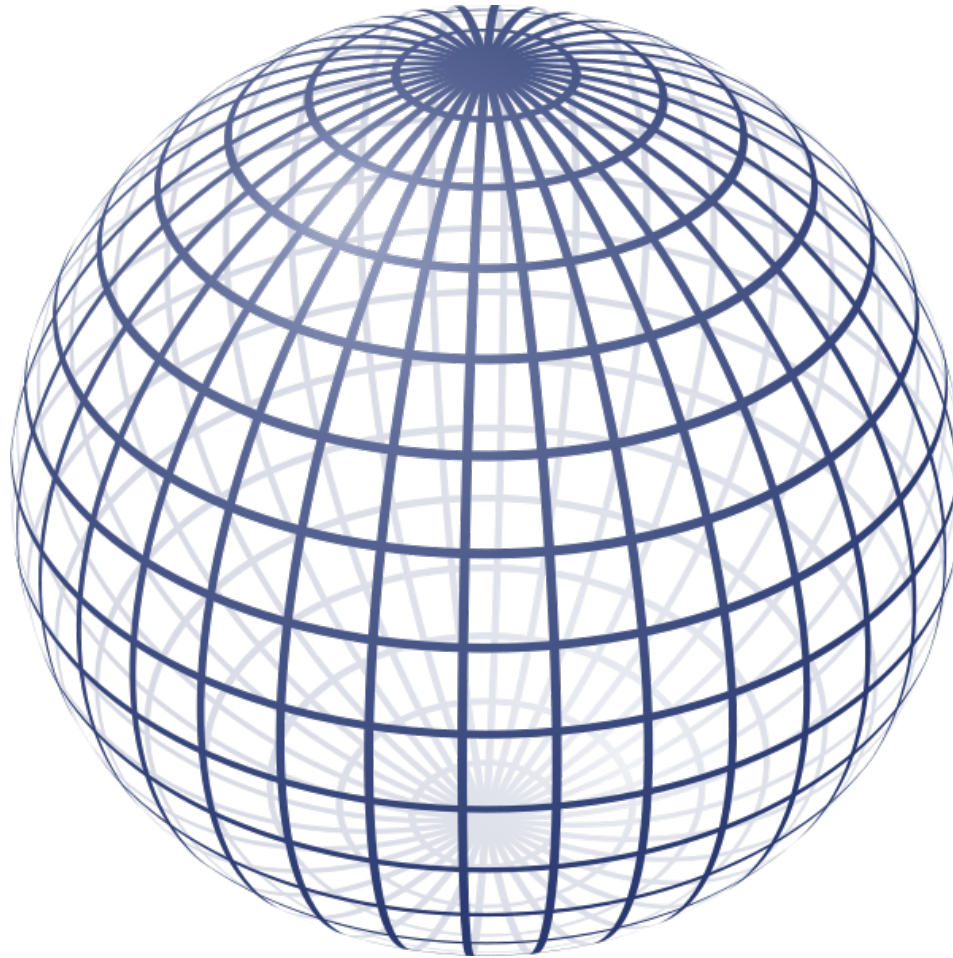
- But what is the Universe?

Schema huius præmissæ diuisionis Sphærarum.
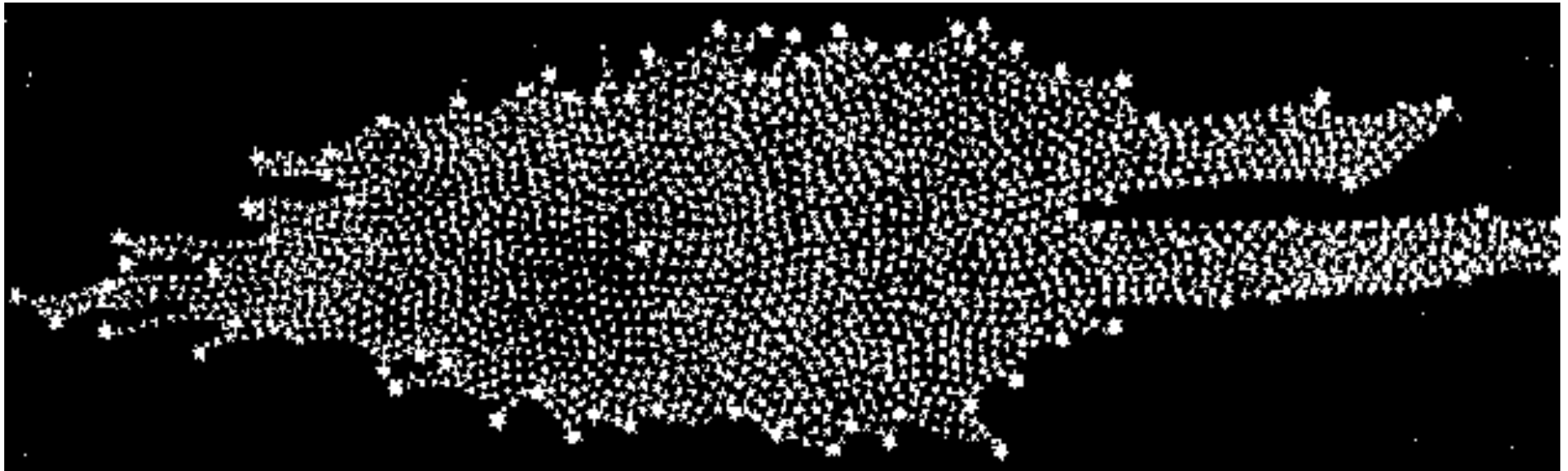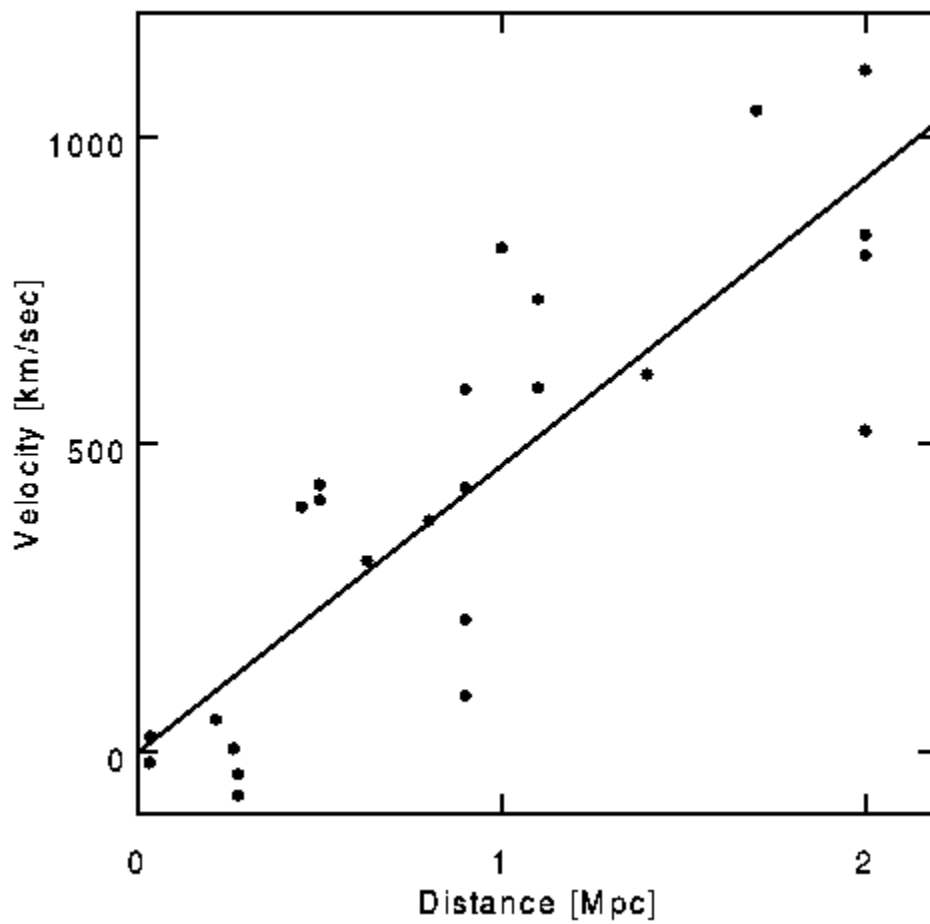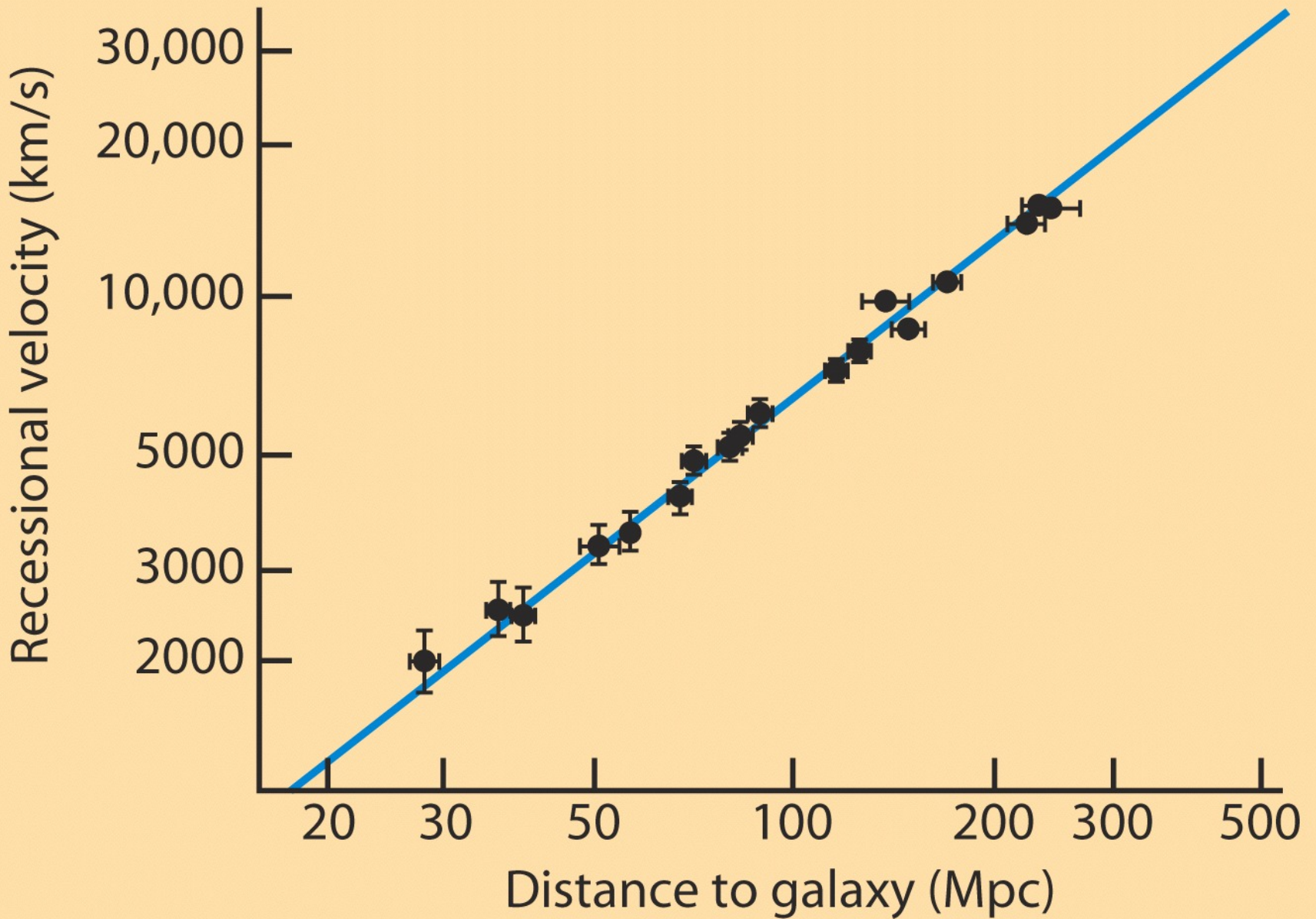
1917: The Einstein Universe

Hubble's first data

The Cosmic Microwave Background

COSMIC MICROWAVE BACKGROUND SPECTRUM FROM COBE

THEORY AND OBSERVATION AGREE