

Astrophysical Fluid Dynamics

Astrophysical Hydrodynamics

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 - b Office hours: You are always welcome to come to my office for short questions. You can also make an appointment via email.
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 - a Office: 192, phone: 8689, email: saikat@astro.rug.nl
- iii. Website course:
www.astro.rug.nl/~weygaert/astrohydro2016.html
- iv The purpose of the course is to complete the fluid mechanics background needed in astrophysics.
- v Attendance of a substantial fraction of course lectures is obligatory.
- vi Problem sets are mandatory and constitute 25% of the final grade

Astrophysical Hydrodynamics

vi Lectures:

| | | | |
|-----------|-------------|-------|----------|
| Monday | 9:00-11:00 | ZG161 | lecture |
| Wednesday | 9:00-11:00 | ZG161 | tutorial |
| Thursday | 11:00-13:00 | ZG161 | lecture |

1st lecture: Monday Feb. 1, 2016

last lecture: Thursday March 24, 2016

vii Written exam at the end of the term:

| | | |
|-----------|---------------|-----------------------|
| Wednesday | April 6, 2016 | 09:00-12:00 (exam) |
| Friday | June 24, 2016 | 09:00-12:00 (re-exam) |

Bibliography

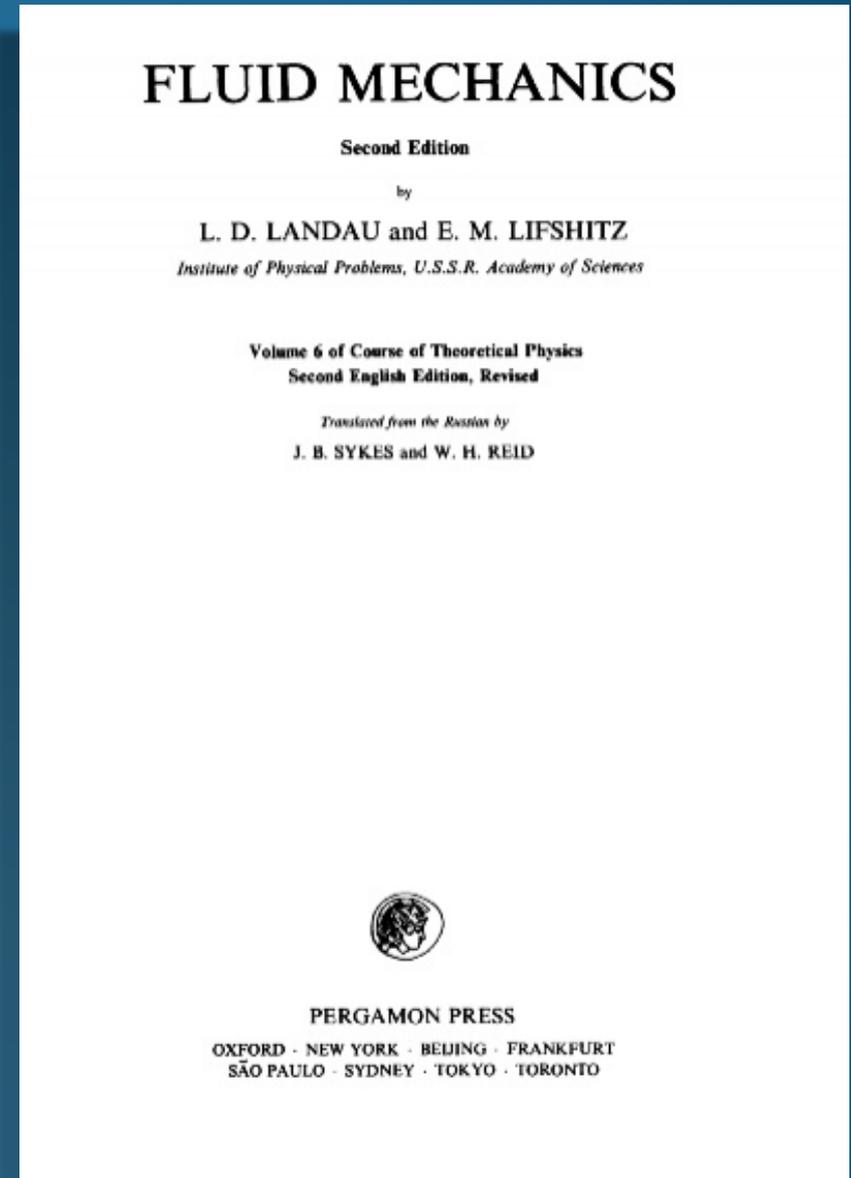
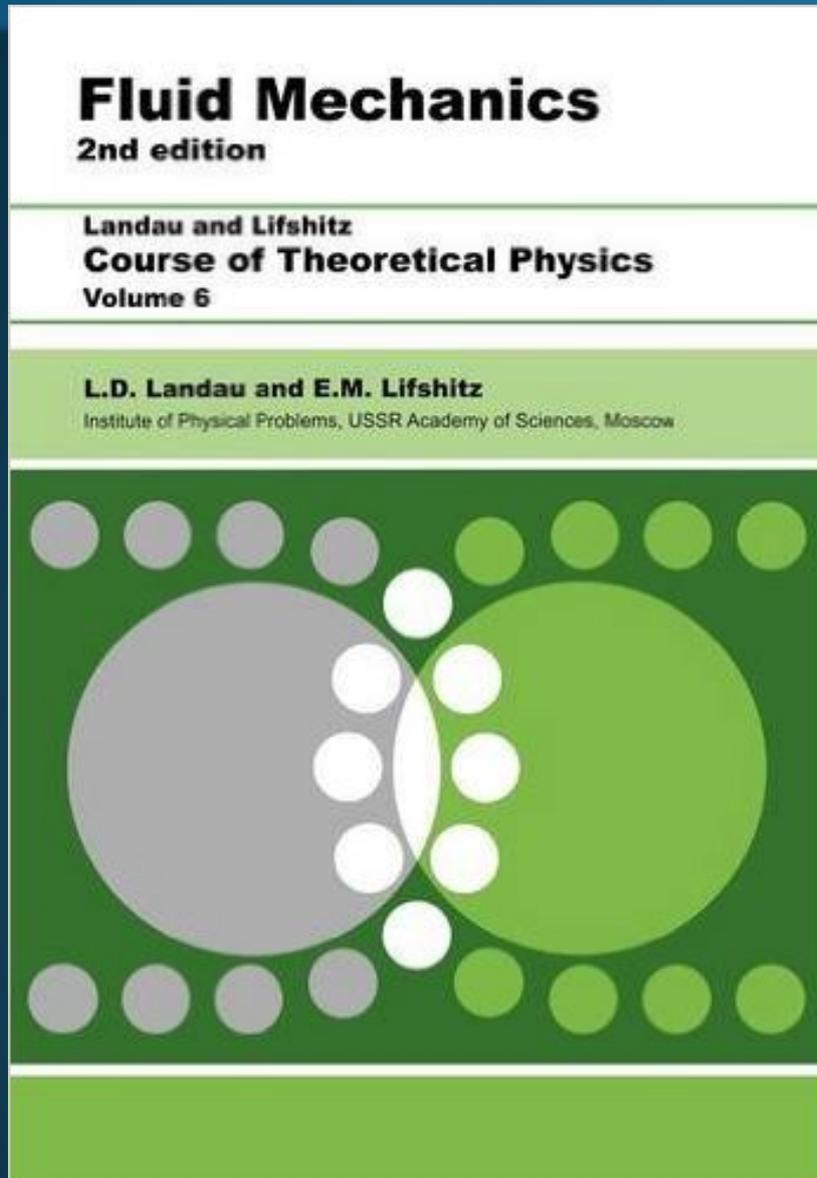
I. The lecture notes and handouts are the main source of material.

However, there are a number of good books that the student can use to clarify some of the topics or for extra material.

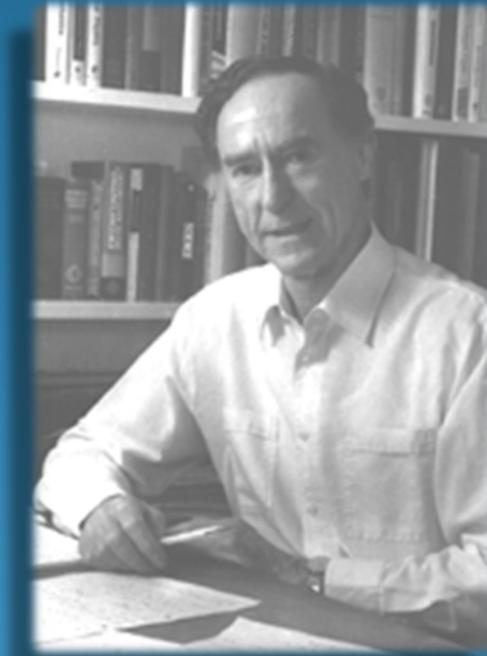
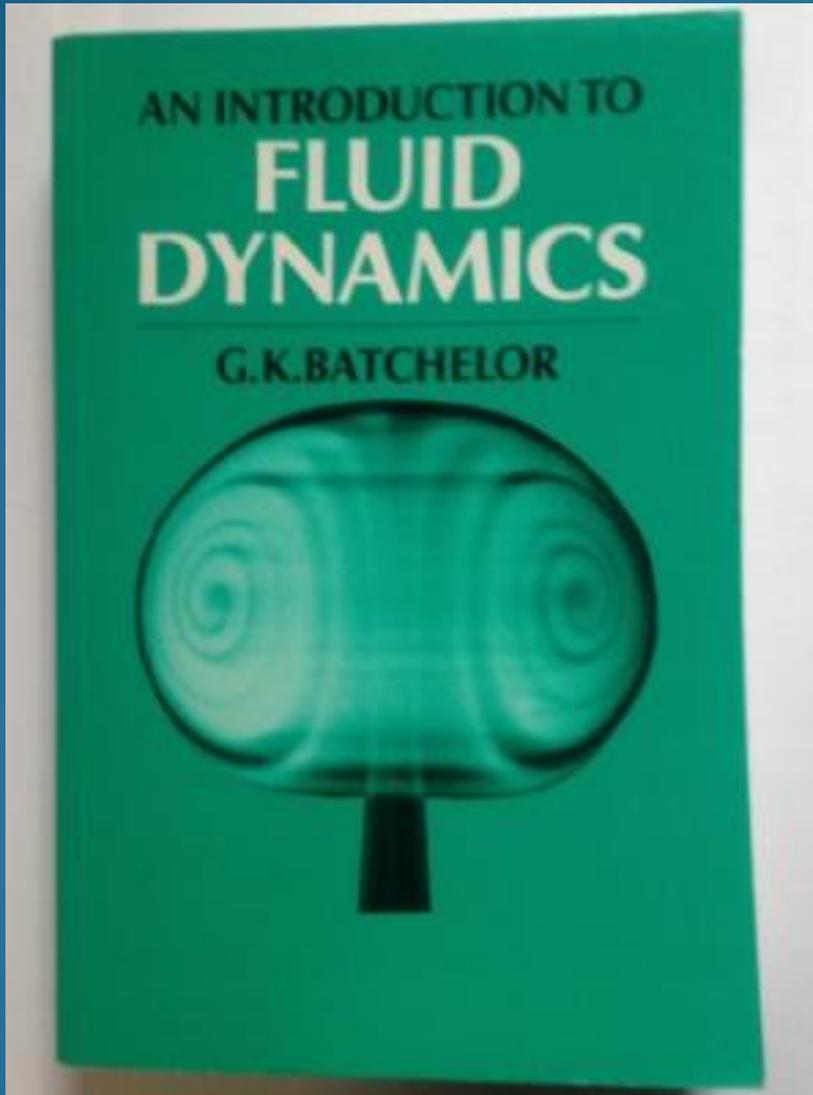
II. Interesting Books:

- **Fluid Mechanics**, Landau and Lifshitz
exceptional book but of somewhat higher level.
- **Gas Dynamics**; Vol. II, Physics of Astrophysics, F. Shu
Univ. Science Books, very good for astrophysical perspective.
- **An Introduction to Fluid Dynamics**, G. K. Batchelor
historic classic, widely regarded as a "bible" for the subject.
Daunting at first sight, but lucid, thorough and reliable.
- **Astrofysica: Inleiding Gasdynamica**, Bram Achterberg (UU)
Very clear and complete treatment of astrophysical hydrodynamics
- **Album of Fluid Motion**, van Dyke
Beautiful photographs showing fluid in motion

Fluid Mechanics, Landau & Lifschitz

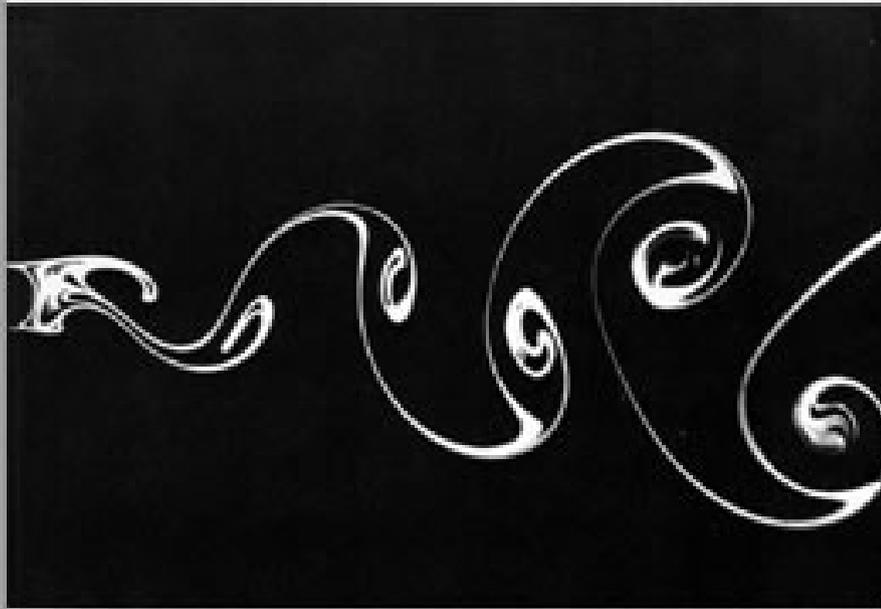


An Introduction to Fluid Mechanics, G.K. Batchelor



Albums of Fluid Motion, Van Dyke

An Album of Fluid Motion

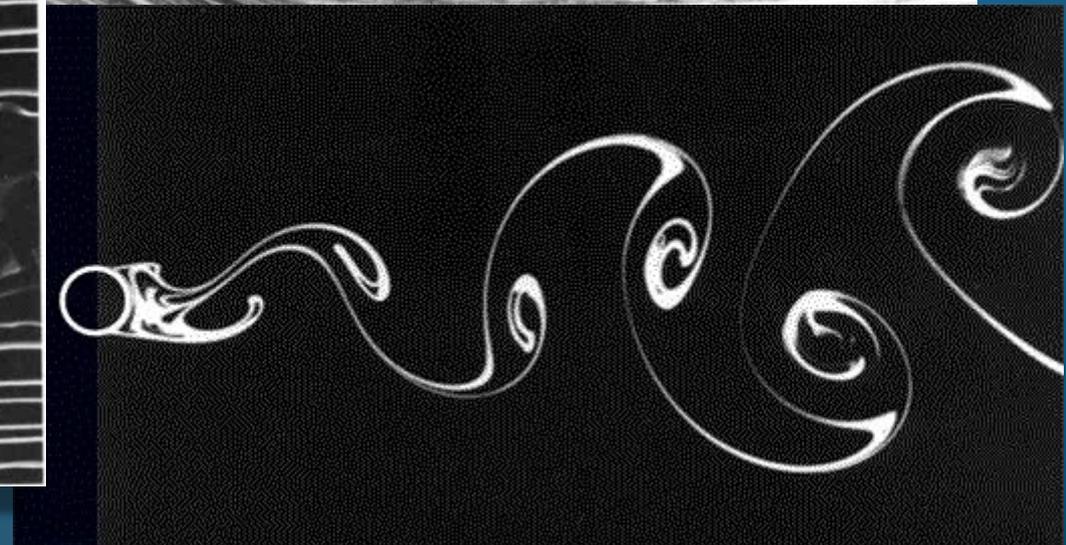
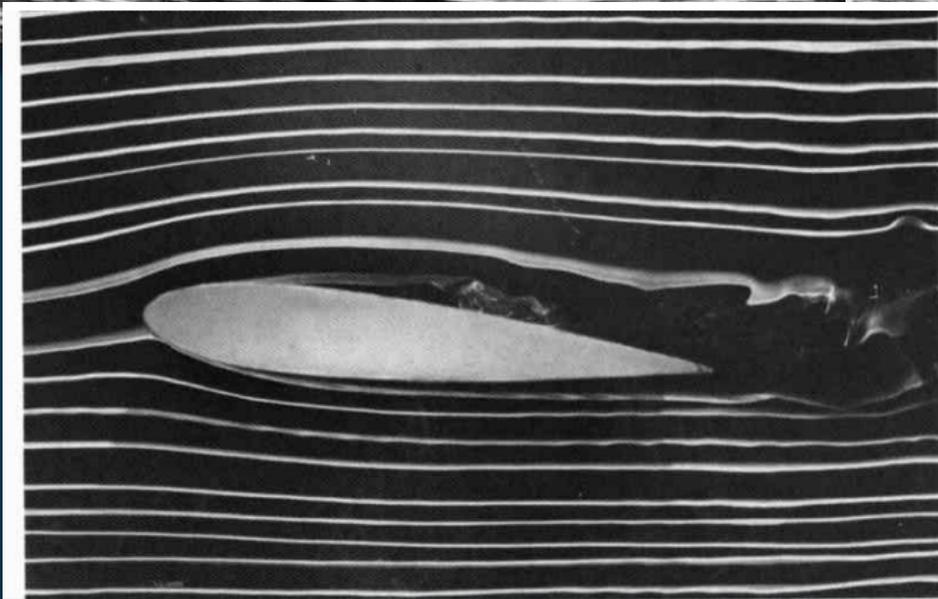
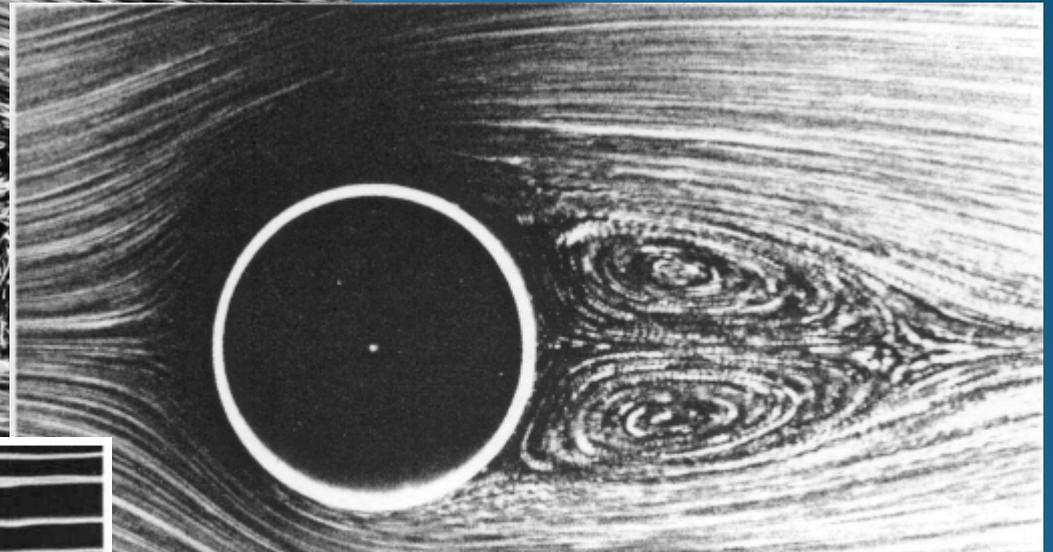
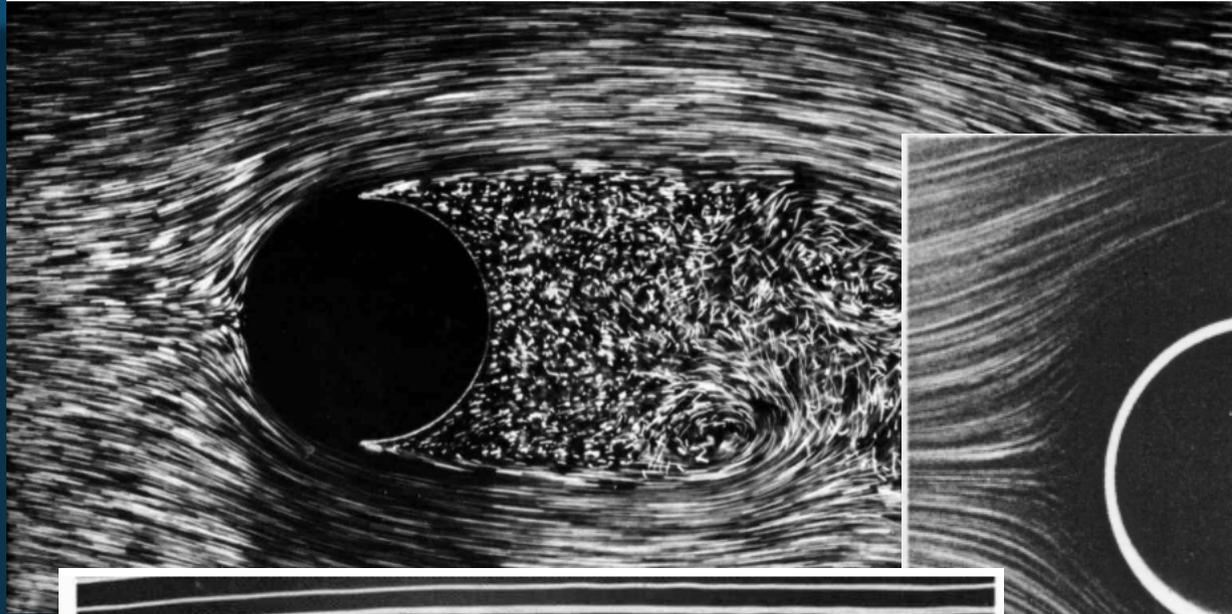


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Albums of Fluid Motion, Van Dyke



Astrophysical Fluid Mechanics

Topics

- I Fluid Picture Book
- II Basic fluid equations of ideal fluids
- III Inviscid Barotropic Flows:
Kelvin Circulation Theorem
Bernoulli Theorem
- IV Incompressible Fluids
Compressible fluids:
- V Waves
- VI Hydrodynamic Instabilities

- VII. Shock Waves
- VIII. Viscous flows:
Navier-Stokes Eqns.
- IX. Turbulence
- X. Numerical
(astro)hydrodynamics