Challenges for Future Energy Concepts

Alexander Auer

Organisatorial outline

- Three lectures at the beginning of the semester (May 13nd, 14th and 15rd):
  - Motivation
  - MacKay “sustainable energy without the hot air !
  - Lecture Notes “energy – where we stand” (2019)
  - Topics
  - How to prepare your talk

- A series of seminars towards the middle of the term (June 24th-26th)
  - Your presentations (20 minutes) sorted by subjects including discussion

- End of August: final oral exam (20 minutes) about :

  your seminar topic, the MacKay book and other talks related to your topic

Organisatorial outline

- Note that due to organisatorial issues there is, unfortunately, a maximum number of participants.
- Only those students who have signed up in the OPAL system and have been admitted will be able to participate.
- All information and updates are available in the OPAL system !

Organisatorial outline

during the semester

seminar talk (20 min)

oral exam (20 min)

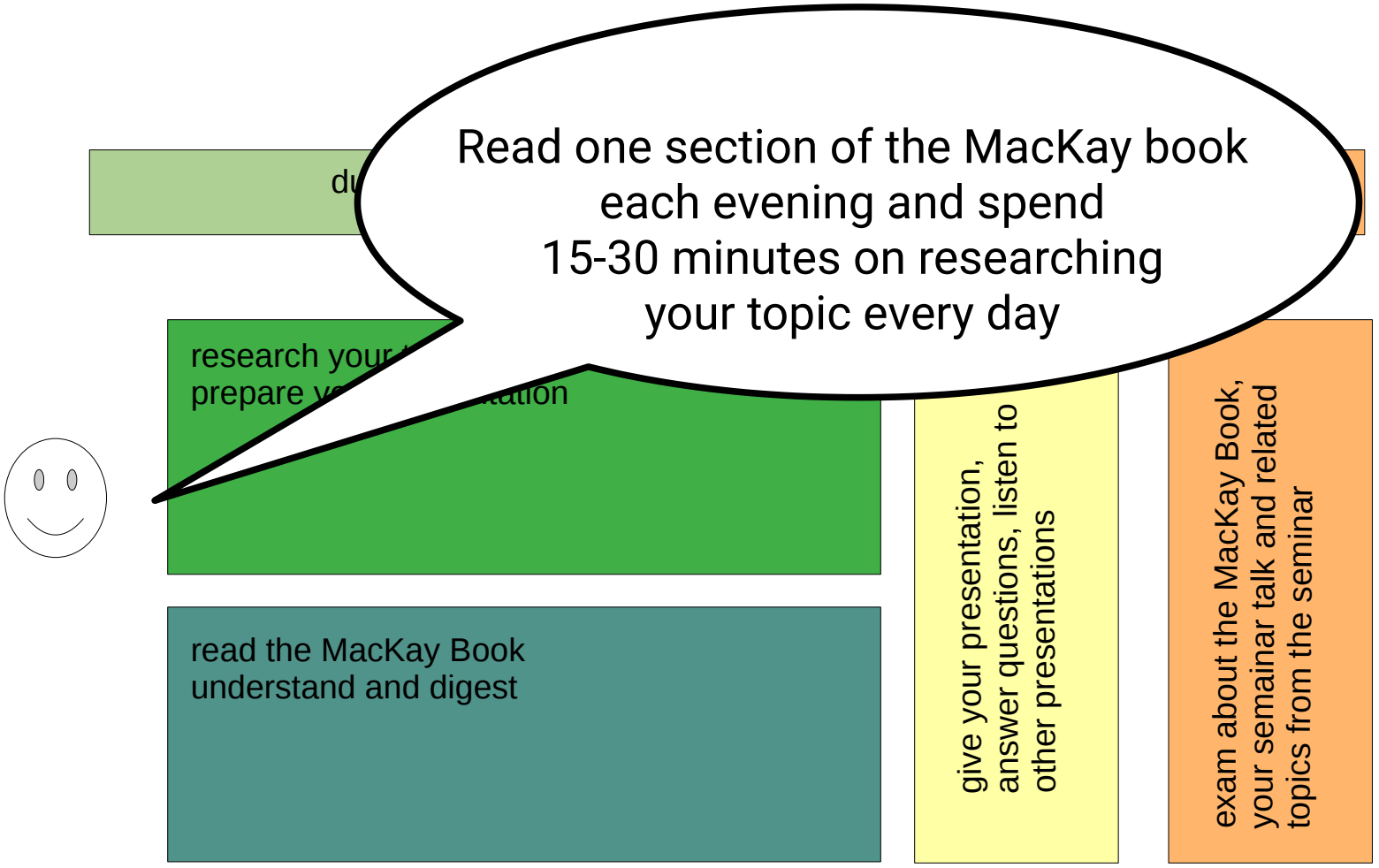
research your topic
prepare your presentation

read the MacKay Book
understand and digest

give your presentation, answer questions, listen to other presentations

exam about the MacKay Book, your semainar talk and related topics from the seminar

Organisatorial outline



Your seminar talk

We have topics covering:

- General and basic topics (energy carriers, fundamental physics etc.)
- Fossil fuels and current technology (combustion)
- Renewable energy sources (solar, wind, etc.)
- Energy conversion and storage (electrolysis)
- Energy economy related topics (transport, grids, etc.)
- Applications and examples (life support systems, methanol economy, etc.)

You talks should be detailed and you should have attained a good knowledge on your topic.

ChatGPT text, Wikipedia or YouTube knowledge and copy-and-paste will not suffice to assemble an acceptable talk or to pass the final exam !!

Your seminar talk

- Criteria for a good talk are :
  - Your talk is on topic (don’t talk about a fuel cell if you should focus on the cathode only, don’t talk about photovoltaic if you should talk about solar thermal technology etc.)
  - You thoroughly understand your topic and are able to explain details and answer detailed questions. Keep in mind that you are addressing material scientists.
  - Your talk shows that you are educated in materials science and understand the chemistry and physics behind the technology.
  - Your presentation shows that you understand the bigger picture and have a scientific approach towards energy systems (work with equations and schemes, refer to literature like the MacKay book).
  - Your slides are tidy and comprehensive, you give references for literature and all images you have used.

Your seminar talk

Source: https://www.pexels.com/photo/lighthouse-located-near-calm-sea-water-4390833

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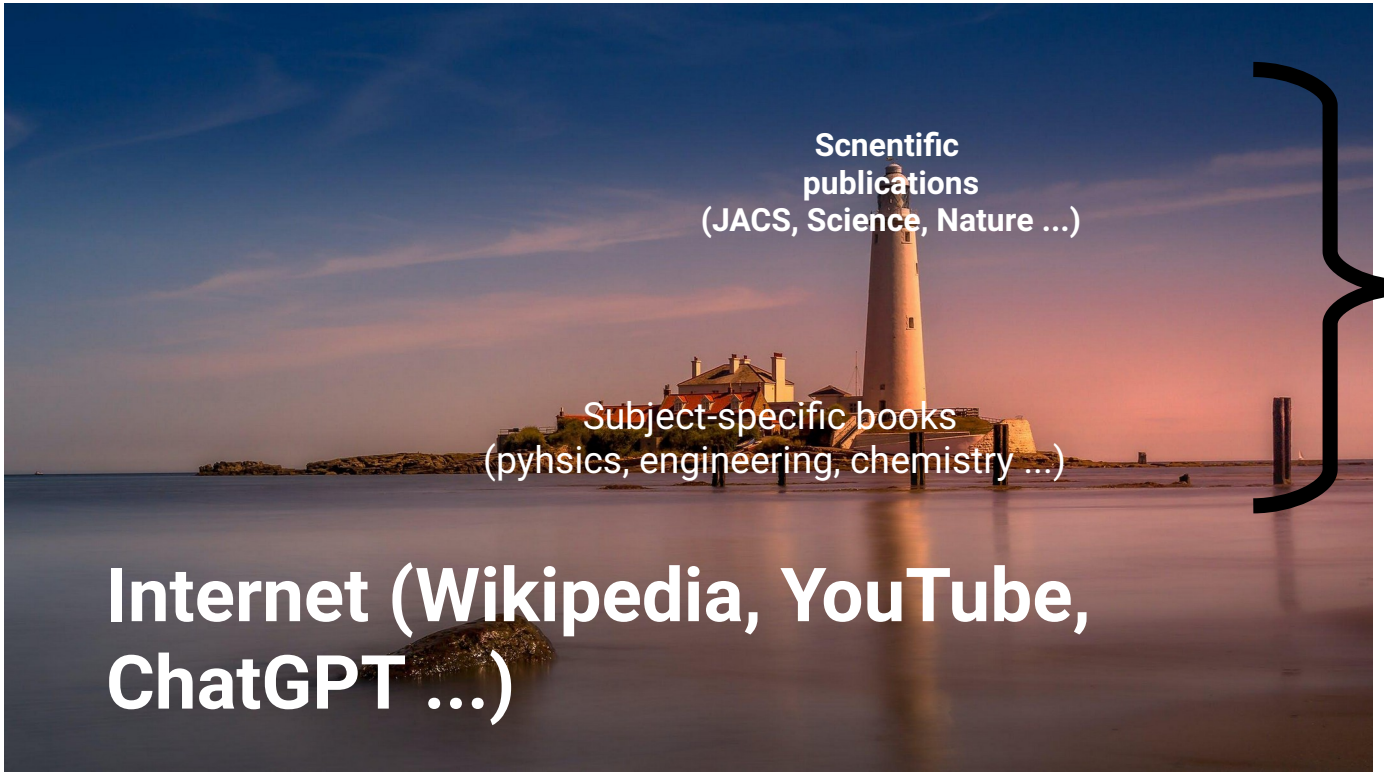

You should be somewhere here ...

Source: https://www.pexels.com/photo/lighthouse-located-near-calm-sea-water-4390833

Your seminar talk

- Your seminar topic will be assigned to you, there is no choice of topics ! This will be done via email during the next few days. **You need to confirm your participation once you obtained your topic via email !**

- You will have enough time to research details and assemble your presentation. I will be available to help you with literature, hints and suggestions any time via email.

- Note that 20 minutes is not a lot of time, so assemble you slides carefully and rather focus on specific aspects in detail than quickly brushing over a lot of things.

- You will be held accountable for plagiarism of slides / talks or if you don’t prepare your contribution yourself if detected.

Aims of this course

- Understand the components and magnitudes of the current energy economy
- Learn how to read and understand the numbers associated with energy systems
- Study the technology of a future energy economy

- ***Learn to focus on the details, be able to think about the bigger picture***

Note that we are material scientists, not politicians, economists or technicians !

Literature and sources

- The “MacKay book” is available online, and while being a little outdate, it is an enjoyable reading and teaches a scientific approach towards energy economy and energy related topics :

  https://www.withouthotair.com (go to “download” to get the free pdf)

- In 2020, the “Lecture Notes of the Joint EPS-SIF International School on Energy" appeard. This series covers a broad range of energy related topics and can be used as reference for many of the topics in the seminar. The different chapters are available at

  https://epjwoc.epj.org/articles/epjconf/abs/2020/22/contents/contents.html

- Besides these, one of the aspects you should learn in this course is to find relevant scientific (!) literature like review articles, research publications and published books and to educate yourself. However, if you have problems finding literature, I can always help you with suggestions and hints.