

STOCHASTIC THERMODYNAMICS OF COMPLEX SYSTEMS

ONLINE CSH WORKSHOP

May 27 – May 29, 2020

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Workshop organizers



David Wolpert



Jan Korbelt

Host institution



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Workshop Genesis

Small workshop (ca 20 participants)



Palais Strozzi, CSH Vienna

COVID 19



Online workshop (ca 100 participants)



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Workshop description & Main aims

Stochastic thermodynamics: *powerful tool for non-equilibrium thermodynamics of small systems*

Main results

$$\frac{p(\bar{\Sigma}_t = A)}{p(\bar{\Sigma}_t = -A)} = e^{At}$$

Fluctuation theorems

$$\frac{\text{Var}(J_\tau)}{\langle J_\tau \rangle^2} \geq \frac{2k_B}{\bar{\Sigma}_t}$$

Thermodynamic uncertainty relations

$$\frac{L(p(0), p(\tau))^2}{2\Sigma_\tau \bar{A}_\tau^2} \leq \tau$$

Speed limits

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Typical assumptions

Linear Markovian dynamics

$$\dot{p}_m(t) = \sum_n W_{mn}(t)p_n(t)$$

No constraints on rate matrices

$$W_{mn}(t) \text{ arbitrary (up to requirement of LDB)}$$

Arbitrary work protocols

$$E(t) \text{ arbitrary}$$

Infinite heat bath(s)

$$p_m^{\nu,*} = \frac{1}{Z} \exp(-\beta^\nu \epsilon_m)$$

Local detailed balance (LDB)

$$\frac{W_{mn}^\nu}{W_{nm}^\nu} = \frac{p_m^{\nu,*}}{p_n^{\nu,*}} = \exp(-\beta^\nu (\epsilon_m - \epsilon_n))$$

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Main question of the workshop:

*How does stochastic thermodynamics
- especially the FT, TUR, SL, etc. -
change if these assumptions do not hold?*

Some preliminary answers are known.
Most questions remain unresolved.

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Workshop website: <https://www.csh.ac.at/event/csh-workshop-stochastic-thermodynamics-complex-systems/>



You can find here:

- Updated agenda
- Presentation files

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Sessions

- Title of each session describes the session's main focus.
- Due to the time zone restrictions, not all talks in a session match the session's title.
- Each session has a session chair who moderates the session

Structure of a session

- Opening remarks by the chair
- 3-4 talks followed by Q&A
- Discussion on the topic of the session

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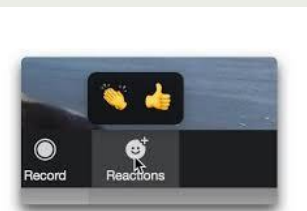
Talks

- 20 minutes long
- No questions during the talk. Please make sure all chat is *private*.

Tip for presenters: laser pointer in Zoom



Tip: you can use the virtual applause after a talk

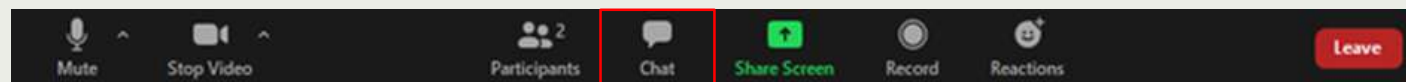


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Q&A

- 10 minute long
- You can ask a question in chat
- Session chair will unmute you and you can ask and/or specify your question
- Q&A can continue in the *private* chat with the speaker

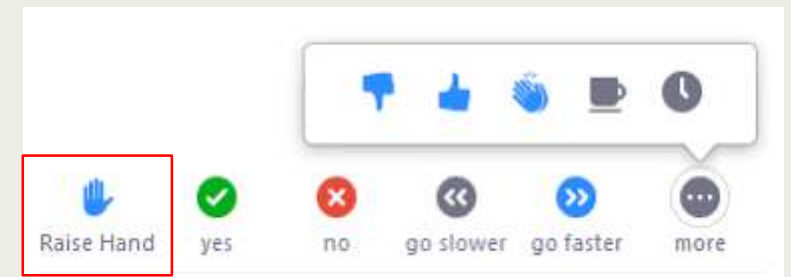
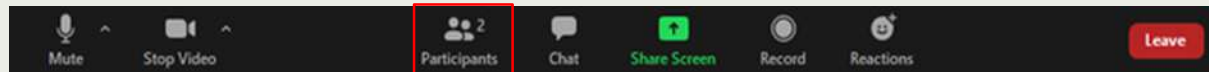


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Discussion session

- At the end of each session
- Moderated by the session chair
- To contribute to the discussion raise your virtual hand



- Session chair will ask you to speak and unmute your microphone