Schedule of Lectures for "Foundational Problems of Thermodynamics and Statistical Mechanics"

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course website:
http://strangebeautiful.com/lmu/2017-winter-thermo-sm.html

Winter, 2017
[*** Day/Time C.T. TBD ***]
Ludwigstr. 31, 021

Contents

N.b.: many of the required and suggested readings are available online at the course's website, though they may not be listed as such in the bibliography:

http://strangebeautiful.com/lmu/2017-winter-thermo-sm.html

1 Week 1: Introduction ([***] Oct)

Required Reading

1. Curiel (2011), "Notes on Learning Philosophy"

Suggested Reading

1. [***]

2 Week 2–5: A Crash Course in Thermodynamics and Statistical Mechanics ([***] Oct)

2.1 Week 2: Thermodynamics I ([***] Oct)

Required Reading

1. Fermi (1956), *Thermodynamics*: [***]

Strongly Suggested Reading

1. [***]

Suggested Reading

1. Sklar (1993)
2. [*** Wallace control versus inferential theory ***]

2.2 Week 3: Thermodynamics II ([***] Nov)

Required Reading

1. Fermi (1956), *Thermodynamics*: [***]

Suggested Reading

1. Sklar (1993)
2. [*** Wallace control versus inferential theory ***]

2.3 Week 4: Statistical Mechanics I ([***] Nov)

Required Reading

1. Schrödinger (1960), *Statistical Thermodynamics*: [***]

Suggested Reading

1. Sklar (1993)

2.4 Week 5: Statistical Mechanics II ([***] Nov)

Required Reading

1. Schrödinger (1960), *Statistical Thermodynamics*: [***]

Suggested Reading

1. [***]
2. Sklar (1993)

3 Weeks 6–8: The 19th-Century Founders ([***] Nov – [***] Dec)

3.1 Week 6: Maxwell ([***] Nov)

1. Maxwell (1867), "On the Dynamical Theory of Gases"
2. Maxwell (1871), *The Theory of Heat*: [***]

Suggested Reading

1. [*** Clausius ***]
2. [*** Wayne's paper ***]
3. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*

3.2 Week 7: Boltzmann ([***] Dec)

1. [*** Boltzmann's book]

Suggested Reading

1. [*** Harvey, Jos and Wayne's paper ***]
2. [*** Planck's book]
3. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*

3.3 Week 8: Gibbs ([***] Dec)

1. [*** Gibbs's book]

Suggested Reading

1. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*

4 Weeks 9–16: The Contemporary Debates ([***])

4.1 Week 9: Equilibrium I ([***])

1. Brown and Uffink (2001)

Suggested Reading

1. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*

4.2 Week 10: Equilibrium II ([***])

1. [*** Norton and Giovanni ***]

Suggested Reading

1. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*

4.3 Week 11: The Second Law I ([***])

1. Reichenbach (1956), *The Direction of Time*: [***]

Suggested Reading

1. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*

4.4 Week 12: The Second Law II ([***])

1. Reichenbach (1956), *The Direction of Time*: [***]

Suggested Reading

1. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*

4.5 Week 13: The Arrows of Time I ([***])

1. Reichenbach (1956), *The Direction of Time*: [***]

Suggested Reading

1. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*
2. Feynman (1965), *The Character of Physical Law*: ch. 5

4.6 Week 14: The Arrows of Time II ([***])

1. Uffink (2001), "Bluff Your Way in the Second Law of Thermodynamics"

Suggested Reading

1. Ehrenfest and Ehrenfest (1959), *The Conceptual Foundations of the Statistical Approach in Mechanics*
2. Feynman (1965), *The Character of Physical Law*: ch. 5

4.7 Week 15: Cosmology ([***])

1. Wallace (2010), "Gravity, Entropy, and Cosmology: In Search of Clarity"

Suggested Reading

1. [*** Callender ***]

4.8 Week 16: Black Holes ([***])

1. Curiel (2016), "Black Holes Really Are Thermodynamical Objects"
2. Curiel (2015), "Are Classical Black Holes Hot or Cold?"

Suggested Reading

1. [*** Callender ***]

5 FINAL PAPER DUE: [***]. Mar

References

Brown, H. and J. Uffink (2001, December). The origins of time-asymmetry in thermodynamics: The minus first law. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics 32*(4), 525–538. doi:10.1016/S1355-2198(01)00021-1.

Curiel, E. (2011). Notes on learning philosophy. Unpublished manuscript, latest version available at http://strangebeautiful.com/papers/curiel-learning-philosophy.pdf.

Curiel, E. (2015). Are classical black holes hot or cold? Unpublished manuscript, submitted to *British Journal for Philosophy of Science*. Preprint: arXiv:1408.3691 [gr-qc].

Curiel, E. (2016). Black holes really are thermodynamical objects. Unpublished manuscript.

Ehrenfest, P. and T. Ehrenfest (1959). *The Conceptual Foundations of the Statistical Approach in Mechanics*. Ithaca, NY: Cornell University Press.

Fermi, E. (1937[1956]). *Thermodynamics*. Dover Publications, Inc. The Dover 1956 edition is an unabridged, unaltered republication of the 1937 Prentice-Hall edition.

Feynman, R. (1965). *The Character of Physical Law*. New York: The Modern Library. A 1994 reprint of the original 1965 edition published by the MIT University Press.

Maxwell, J. C. (1867). On the dynamical theory of gases. *Philosophical Transactions of the Royal Society (London) 157*, 49–88. Reprinted in *The Scientific Papers of J. C. Maxwell* (2 volumes printed as one), Volume ***, W. Niven (Ed.). New York: Dover Publications, Inc., 1965, [*** pp ***].

Maxwell, J. C. (1871). *The Theory of Heat*. London: Longmans, Green & Co.

Reichenbach, H. (1956). *The Direction of Time*. Berkeley: University of California Press. Edited posthumously by Maria Reichenbach. Reprinted in 1991 with a foreward by H. Putnam.

Schrödinger, E. (1960). *Statistical Thermodynamics* (Second ed.). Cambridge: Cambridge University Press. A course of seminar lectures, delivered in January–March 1944, at the School of Theoretical Physics, Dublin Institute for Advanced Studies.

Sklar, L. (1993). *Physics and Chance: Philosophical Issues in the Foundations of Statistical Mechanics*. Cambridge: Cambridge University Press.

Uffink, J. (2001, 3). Bluff your way in the Second Law of thermodynamics. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics 32*, 305–394.

Wallace, D. (2010). Gravity, entropy, and cosmology: In search of clarity. *British Journal for the Philosophy of Science 61*(3), 513–540. doi:10.1093/bjps/axp048.