Schedule of Lectures
"The Philosophy of Space, Time and Spacetime"

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course website:
http://strangebeautiful.com/lmu/2015-winter-space-time-st.html

Winter, 2015–2016
Wednesdays, 12:00–14:00 C.T.
Ludwigstr. 31, 021

Contents

The only required book for the course is *General Relativity from A to B*, by R. Geroch, available used at most online booksellers (*e.g.*, Amazon). Most of the required and suggested readings (including the Geroch book) will be made available online at the course's website, though they may not be listed as such in the bibliography:
http://strangebeautiful.com/lmu/2015-winter-space-time-st.html
Any readings not available on the website should be downloadable directly from the journals in which they appear, through the university library's online e-journal access system.

1 Week 1: Introduction, Overview, Historical Background (Oct. 14)

Descartes' catastrophic fuck-ups, to set the stage for the triumphs of Newton, Huygens, *et al.*

Required Reading

1. Curiel (2011), "Notes on Learning Philosophy"
2. Geroch (1981), *General Relativity from A to B*: Preface; Introduction; chs. 1–2

Suggested Reading

1. Descartes (1644), *The Principles of Philosophy*
2. Disalle (2004), "Newton's Philosophical Analysis of Space and Time": pp. 36–38
3. DiSalle (2006b), *Understanding Space-Time*: ch. 2, §3, pp. 17–20
4. Stein (2004), "Newton's Metaphysics": pp. 256–283
5. Stein (shedc), "On Metaphysics and Method in Newton": pp. 27–34
6. Stein (shedb), "Newton: Philosophy of Inquiry and Metaphysics of Nature": pp. 20–27

2 Weeks 2–4: Newton's Absolute Space and Time (Oct. 21–Nov. 04)

2.1 Week 2: Newton's Dynamics (Oct. 21)

Newton's system of mechanics as the condition for his conception of space and time

Required Reading

1. Newton (1999b), *Philosophiæ Naturalis Principia Mathematica*: Author's Preface (pp. 381–383); Definitions (pp. 403–408); Axioms, or the Laws of Motion and Scholium (pp. 416–430); Rules for the Study of Natural Philosophy (pp. 794–796)

Suggested Reading

1. Brading (2013), "Newton's Law-Constitutive Approach to Bodies: A Response to Descartes"
2. Cohen (1985), *The Birth of a New Physics*: ch. 7
3. Cohen (2004), "Newton's Concepts of Force and Mass, with Notes on the Laws of Motion"
4. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: chs. 1–2, 5
5. Domski (2012), "Introduction: Newton and Newtonianism"
6. Earman (1989b), *World Enough and Space-Time: Absolute versus Relational Theories of Space and Time*: ch. 1
7. Friedman (1983), *Foundations of Space-Time Theories: Relativistic Physics and Philosophy of Science*: ch. II; ch. III, §§1–2, 6–8
8. Garber (2013), "Leibniz, Newton and Force"
9. Janiak (2012), "Newton and Descartes: Theology and Natural Philosophy"
10. Maxwell (1877), *Matter and Motion*: chs. I–III; VI, articles 98–105
11. Newton (1999b), *Philosophiæ Naturalis Principia Mathematica*: General Scholium (pp. 939–944)
12. Newton (shed), "De Gravitatione et Æquipondio Fluidorum"
13. Smith (2004), "The Methodology of the *Principia*"
14. Stein (1967), "Newtonian Space-Time"
15. Stein (1990), "'From the Phænomena of Motions to the Forces of Nature': Hypothesis or Deduction?"
16. Stein (2004), "Newton's Metaphysics"
17. Stein (shedb), "Newton: Philosophy of Inquiry and Metaphysics of Nature"
18. Stein (shedc), "On Metaphysics and Method in Newton"
19. Stein (sheda), "Further Considerations on Newton's Method"
20. Torretti (1984), *Relativity and Geometry*: ch. 1
21. Westfall (1983), *Never at Rest: A Biography of Isaac Newton*

German Editions

1. Hutter (1989), *Die Andänge der Mechanik: Newtons Principia gedeutet aus ihrer Zeit und ihrer Wirkung auf die Physik*
2. Maxwell (1881), *Substanz und Bewegung*
3. Newton (1872), *Sir Isaac Newtons mathematische Principien der Naturlehre*
4. Newton (1999a), *Die mathematischen Prinzipien der Physik: Philosophiae Naturalis Principia Mathematica*
5. Newton (2014), *Mathematische Grundlagen der Naturphilosophie: Philosophiæ Naturalis Principia Mathematica*
6. Schneider (1988), *Isaac Newton*

7. Newton (1988), *Über die Gravitation...*
8. Steinle (1991), *Newtons Entwurf "Über die Gravitation...": Ein Stück Entwicklungsgeschichte seiner Mechanik*
9. Westfall (1996), *Isaac Newton – Eine Biographie*

2.2 Weeks 3–4: Newton on Space and Time (Oct. 28–Nov. 04)

Newton's conception of space and time

Required Reading

1. Newton (shed), "De Gravitatione et Æquipondio Fluidorum": pp. 1–2 (beginning up through the paragraph ending "as are required for local motion"); pp. 5–7 (from the paragraph starting "It may perhaps now be expected..." through the one ending "created his own ubiquity")
2. Newton (1999b), *Philosophiæ Naturalis Principia Mathematica*: Scholium to the Definitions (pp. 408–415); Rules for the Study of Natural Philosophy (pp. 794–796); General Scholium (pp. 939–944)
3. Newton (1730), *Opticks*: Quest. 31, 1st paragraph (pp. 375–376); Quest. 31, pp. 397–406 (the paragraph beginning "And thus Nature will be..." to the end of the book)
4. Geroch (1981), *General Relativity from A to B*: ch. 3

Suggested Reading

1. DiSalle (1994), "On Dynamics, Indiscernibility, and Spacetime Ontology"
2. Disalle (2004), "Newton's Philosophical Analysis of Space and Time"
3. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: chs. 1–2, 5
4. Earman (1989b), *World Enough and Space-Time: Absolute versus Relational Theories of Space and Time*: chs. 2–3; ch. 4, §1
5. Friedman (1983), *Foundations of Space-Time Theories: Relativistic Physics and Philosophy of Science*: ch. II; ch. II, §§1–2, 6–8
6. Grünbaum (1977), "Absolute and Relational Theories of Space and Space-Time"
7. Hutter (1989), *Die Andänge der Mechanik: Newtons Principia gedeutet aus ihrer Zeit und ihrer Wirkung auf die Physik*
8. Janiak (2006), *Newton as Philosopher*: ch. 5
9. Maxwell (1877), *Matter and Motion*: chs. I–III; VI, articles 98–105
10. Newton (1872), *Sir Isaac Newtons mathematische Principien der Naturlehre*
11. Newton (1999a), *Die mathematischen Prinzipien der Physik: Philosophiae Naturalis Principia Mathematica*
12. Newton (2014), *Mathematische Grundlagen der Naturphilosophie: Philosophiæ Naturalis Principia Mathematica*
13. Rynasiewicz (1995a), "By Their Properties, Causes and Effects: Newton's Scholium on Time, Space, Place and Motion — I. The Text"
14. Rynasiewicz (1995b), "By Their Properties, Causes and Effects: Newton's Scholium on Time, Space, Place and Motion — II. The Context"

15. Sklar (1976), *Space, Time and Spacetime*: ch. III, §A & §B.1
16. Smith (2004), "The Methodology of the *Principia*"
17. Stein (1967), "Newtonian Space-Time"
18. Stein (1977a), "On Space-Time Ontology: Extracts of a Letter to Adolf Grünbaum"
19. Stein (1977b), "Some Philosophical Prehistory of General Relativity": §§I–IV, pp. 3–14
20. Stein (1990), "'From the Phænomena of Motions to the Forces of Nature': Hypothesis or Deduction?"
21. Stein (2004), "Newton's Metaphysics"
22. Stein (shedb), "Newton: Philosophy of Inquiry and Metaphysics of Nature"
23. Stein (shedc), "On Metaphysics and Method in Newton"
24. Stein (sheda), "Further Considerations on Newton's Method"
25. Torretti (1984), *Relativity and Geometry*: ch. 1
26. Westfall (1983), *Never at Rest: A Biography of Isaac Newton*

German Editions

1. Hutter (1989), *Die Andänge der Mechanik: Newtons Principia gedeutet aus ihrer Zeit und ihrer Wirkung auf die Physik*
2. Maxwell (1881), *Substanz und Bewegung*
3. Newton (1872), *Sir Isaac Newtons mathematische Principien der Naturlehre*
4. Newton (1999a), *Die mathematischen Prinzipien der Physik: Philosophiae Naturalis Principia Mathematica*
5. Newton (2014), *Mathematische Grundlagen der Naturphilosophie: Philosophiæ Naturalis Principia Mathematica*
6. Schneider (1988), *Isaac Newton*
7. Newton (1988), *Über die Gravitation...*
8. Steinle (1991), *Newtons Entwurf "Über die Gravitation...": Ein Stück Entwicklungsgeschichte seiner Mechanik*
9. Westfall (1996), *Isaac Newton – Eine Biographie*

3 Weeks 5–7: Huygens' and Leibniz's Relationalism (Nov. 11–25)

3.1 Week 5: The Leibniz-Clarke Debate, Part I (Nov. 11)

Required Reading

1. Leibniz and Clarke (1956), *The Leibniz-Clarke Correspondence*: Preface; Introduction; Advertisement to the Reader; Leibniz's Second Paper through Clarke's Fourth Reply, pp. 15–54

Suggested Reading

1. Barbour (1982), "Relational Concepts of Space and Time"
2. Belot (2001), "The Principle of Sufficient Reason"
3. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: ch. 2, §§3, 9

4. Earman (1989a), "Remarks on Relational Theories of Motion"
5. Earman (1989b), *World Enough and Space-Time: Absolute versus Relational Theories of Space and Time*: ch. 3; ch. 4, §§1–4; ch. 6
6. Grünbaum (1977), "Absolute and Relational Theories of Space and Space-Time"
7. Meli (2004), "Newton and the Leibniz-Clarke Correspondence"
8. Roberts (2003), "Leibniz on Force and Absolute Motion"
9. Sklar (1976), *Space, Time and Spacetime*: ch. III, §B.2 & §C
10. Stein (1977a), "On Space-Time Ontology: Extracts of a Letter to Adolf Grünbaum"
11. Stein (1977b), "Some Philosophical Prehistory of General Relativity": §§I–IV, pp. 3–14

3.2 Weeks 6–7: The Leibniz-Clarke Debate, Part II; Huygen's Views (Nov. 18–25)

Required Reading

1. Leibniz and Clarke (1956), *The Leibniz-Clarke Correspondence*: Leibniz's Fifth Paper through Clarke's Fifth Reply, pp. 55–121
2. Huygens (1995a), "On the Motion of Bodies Resulting from Impact": Hypotheses; Propositions I–VI, pp. 1–6
3. Stein (1977b), "Some Philosophical Prehistory of General Relativity": Appendix, pp. 39–49

Suggested Reading

1. Barbour (1982), "Relational Concepts of Space and Time"
2. Belot (2001), "The Principle of Sufficient Reason"
3. Bernstein (1984), "Leibniz and Huygens on the 'Relativity' of Motion"
4. Earman (1989a), "Remarks on Relational Theories of Motion"
5. Earman (1989b), *World Enough and Space-Time: Absolute versus Relational Theories of Space and Time*: ch. 3; ch. 4, §§1–4; ch. 6
6. Grünbaum (1977), "Absolute and Relational Theories of Space and Space-Time"
7. Huygens (1995b), "The Pendulum Clock, Part 4: On the Center of Oscillation"
8. Huygens (shed), "On Centrifugal Force"
9. Roberts (2003), "Leibniz on Force and Absolute Motion"
10. Rynasiewicz (1995b), "By Their Properties, Causes and Effects: Newton's Scholium on Time, Space, Place and Motion — II. The Context"
11. Sklar (1976), *Space, Time and Spacetime*: ch. III, §B.2 & §C
12. Slowik (2009), "Another Go-Around on Leibniz and Rotation"
13. Stein (1967), "Newtonian Space-Time"
14. Stein (1977a), "On Space-Time Ontology: Extracts of a Letter to Adolf Grünbaum"
15. Stein (1977b), "Some Philosophical Prehistory of General Relativity": §§I–IV, pp. 3–14

German Editions

1. Huygens (1903), *Nachgelassene Abhandlungen: Über die Bewegung der Körper durch den Stoss. Über die Centrifugalkraft.*

4 Weeks 8–9: 19th Century Revolutions: Riemann, Helmholtz and Poincaré (Dec. 02–Dec. 09)

Developments in mathematical and physical geometry after Newton, and their impact on the possible understanding of space

4.1 Week 8: Riemann and Helmholtz (Dec. 02)

The discovery and development of differential geometry, and its initial application to the modeling of physical geometry in space

Required Reading

1. Riemann (1854), "Über die Hypothesen, welche der Geometrie zu Grunde liegen" ("On the Hypotheses, Which Lie at the Basis of Geometry")
2. Curiel (2014), "A Glossary for Riemann's "On the Hypotheses, Which Lie at the Basis of Geometry" ("Über die Hypothesen, welche der Geometrie zu Grunde liegen")"
3. Helmholtz (1870), "Über den Ursprung und die Bedeutung der geometrischen Axiome" ("On the Origin and Significance of the Geometrical Axioms")

Suggested Reading

1. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: ch. 3, §§5–6
2. DiSalle (2006a), "Kant, Helmholtz, and the Meaning of Empiricism"
3. Gauss (1979), "General Investigations of Curved Surfaces"
4. Harper (1995), "Kant, Riemann and Reichenbach on Space and Geometry"
5. Helmholtz (1868), "Über die Tatsachen, welche der Geometrie zu Grunde liegen" ("On the Facts, Which Lie at the Basis of Geometry")
6. Hyder (2009), *The Determinate World: Kant and Helmholtz on the Physical Meaning of Geometry*
7. Reichenbach (1958), *The Philosophy of Space & Time*: ch. I
8. Sklar (1976), *Space, Time and Spacetime*: ch. II, §B.5–6
9. Stein (1977b), "Some Philosophical Prehistory of General Relativity": §§VI–VIII, pp. 21–26
10. Torretti (1978), *Philosophy of Geometry from Riemann to Poincaré*: ch. 2, §§1–3; ch. 3, §1
11. Weyl (1949), *Philosophy of Mathematics and Natural Science*: Part I, ch. III; Part II, ch. 1

German Editions

1. Gauss (1889), *Allgemeine Flächentheorie*
2. Reichenbach (1977), *Die Philosophie der Raum-Zeit-Lehre*

4.2 Week 9: Poincaré (Dec. 09)

geometrical conventionalism

Required Reading

1. Poincaré (1905), *Science and Hypothesis*: Part II, chs. III–V (pp. 42–100)

Suggested Reading

1. Coffa (1986), "From Geometry to Tolerance: Sources of Conventionalism in 19th Century Geometry"
2. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: ch. 3, §§6–8
3. Earman (1989b), *World Enough and Space-Time: Absolute versus Relational Theories of Space and Time*: ch. 4, §§9–10
4. Friedman (1983), *Foundations of Space-Time Theories*: ch. VII
5. Lützen (2006), "Images and Conventions: Kantianism, Empiricism, and Conventionalism in Hertz's and Poincaré's Philosophies of Space and Mechanics"
6. Mach (1960), *Space and Geometry*
7. Weatherall and Manchak (2014), "The Geometry of Conventionality"
8. Reichenbach (1958), *The Philosophy of Space & Time*: ch. I
9. Sklar (1976), *Space, Time and Spacetime*: ch. 2, §F
10. Sklar (1977), "Facts, Conventions and Assumptions in the Theory of Spacetime"
11. Stein (1977b), "Some Philosophical Prehistory of General Relativity": §V, pp. 14–21
12. Stein (shedd), "Physics and Philosophy Meet: the Strange Case of Poincaré"
13. Torretti (1984), *Relativity and Geometry*: ch. 7, §2
14. Torretti (1978), *Philosophy of Geometry from Riemann to Poincaré*: ch. 4, §4
15. Weyl (1949), *Philosophy of Mathematics and Natural Science*: Part I, ch. III; Part II, ch. 1

German Editions

1. Reichenbach (1977), *Die Philosophie der Raum-Zeit-Lehre*

5 Weeks 10–12: Time and Simultaneity in Special Relativity (Dec. 16–Jan. 13)

5.1 Week 10: The Kinematics of Special Relativity, and the Geometry of Minkowski Spacetime (Dec. 16)

Required Reading

1. Geroch (1981), *General Relativity from A to B*: chs. 4–5

Suggested Reading

1. Brown (2005), *Physical Relativity: Space-Time Structure from a Dynamical Perspective*: chs. 1–5, 7–8

2. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: ch. 4, §§1–3
3. Earman (1989b), *World Enough and Space-Time*: ch. 5, §§3-7
4. Einstein (1905), "On the Electrodynamics of Moving Bodies"
5. Friedman (1983), *Foundations of Space-Time Theories*: ch. IV
6. Malament (2009), "Lecture Notes on Geometry and Spacetime": §§1–2; §3.1–2
7. Russell (1997), *The ABC of Relativity*
8. Russell (1927), *The Analysis of Matter*: ch. V
9. Sklar (1976), *Space, Time and Spacetime*: ch. 2, §C.1; ch. 4, §§A–C
10. Synge (1960b), *Relativity: The Special Theory*
11. Torretti (1984), *Relativity and Geometry*: ch. 4
12. Torretti (1978), *Philosophy of Geometry from Riemann to Poincaré*: ch. 4, §4

5.2 DEC. 23: NO LECTURE

Go on holiday! Enjoy yourselves!

5.3 JAN. 06: NO LECTURE

Heilige Drei Könige! State-mandated day of relaxation! Enjoy yourselves!

5.4 Week 11: The Relativity of Simultaneity (Jan. 13)

Required Reading

1. Malament (1977), "Causal Theories of Time and the Conventionality of Simultaneity"

Suggested Reading

1. Belot (2013), "Time in Classical and Relativistic Physics"
2. Brown (2005), *Physical Relativity: Space-Time Structure from a Dynamical Perspective*: ch. 6
3. Earman (1972), "Notes on the Causal Theory of Time"
4. Friedman (1977), "Simultaneity in Newtonian Mechanics and Special Relativity"
5. Friedman (1983), *Foundations of Space-Time Theories*: ch. IV, §§6–7
6. Grünbaum (2010), "David Malament and the Conventionality of Simultaneity: A Reply"
7. Hogarth (2005), "Conventionality of Simultaneity: Malament's Result Revisited"
8. Janis (1983), "Simultaneity and Conventionality"
9. Malament (2009), "Lecture Notes on Geometry and Spacetime": §3.3–4
10. Reichenbach (1958), *The Philosophy of Space & Time*: ch. II; ch. III, §§24–25
11. Sarkar and Stachel (1999), "Did Malament Prove the Non-Conventionality of Simultaneity in the Special Theory of Relativity?"
12. Sklar (1976), *Space, Time and Spacetime*: ch. 4, §E
13. Stein (1968), "On Einstein-Minkowski Spacetime"
14. Stein (1970), "A Note on Time and Relativity Theory"
15. Stein (2009), ""Definability," "Conventionality," and Simultaneity in Einstein-Minkowski Space-Time"

16. Torretti (1984), *Relativity and Geometry*: ch. 7, §1

German Editions

1. Reichenbach (1977), *Die Philosophie der Raum-Zeit-Lehre*

5.5 Week 12: The Problem of Becoming (Jan. 20)

Required Reading

1. Putnam (1967), "Time and Physical Geometry"
2. Stein (1991), "On Relativity Theory and Openness of the Future"

Suggested Reading

1. Belot (2007), "The Representation of Time and Change in Mechanics"
2. Ben-Yami (2015), "Causal Order, Temporal Order, and Becoming in Special Relativity"
3. Clifton and Hogarth (1995), "The Definability of Objective Becoming in Minkowski Spacetime"
4. Dieks (1988), "Discussion: Special Relativity and the Flow of Time"
5. Dieks (2006a), "Becoming, Relativity and Locality"
6. Dorato (2006), "Absolute Becoming, Relational Becoming and the Arrow of Time: Some Non-Conventional Remarks on the Relationship Between Physics and Metaphysics"
7. Earman (2008), "Reassessing the Prospects for a Growing Block Model of the Universe"
8. Gibson and Pooley (2006), "Relativistic Persistence"
9. Maxwell (1985), "Are Probabilism and Special Relativity Incompatible?"
10. Miller (2013), "Presentism, Eternalism, and the Growing Block"
11. Saunders (2002), "How Relativity Contradicts Presentism"
12. Sklar (1981), "Time, Reality and Relativity"
13. Stein (1968), "On Einstein-Minkowski Spacetime"
14. Stein (1970), "A Note on Time and Relativity Theory"

6 Weeks 13–14: General Relativity: The New Funkiness (Jan. 27–Feb. 3)

6.1 Week 13: Curved Spacetime: The Unification of Gravity and Inertia (Jan. 27)

Required Reading

1. Geroch (1981), *General Relativity from A to B*: ch. 6

Suggested Reading

1. Brown (2005), *Physical Relativity: Space-Time Structure from a Dynamical Perspective*: ch. 9
2. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: ch. 4, §§4–5

3. Eddington (1920), *Space, Time & Gravitation: An Outline of the General Theory of Relativity*
4. Eddington (1923), *Mathematical Theory of Relativity*
5. Einstein (2001), *Relativity: The Special and General Theory*
6. Friedman (1983), *Foundations of Space-Time Theories*: ch. V
7. Lehmkuhl (2014), "Why Einstein Did Not Believe That General Relativity Geometrizes Gravity"
8. Malament (2012), *Topics in the Foundations of General Relativity and Newtonian Gravitational Theory*: ch. 2, §§1–4
9. Russell (1927), *The Analysis of Matter*: chs. VI–IX
10. Sklar (1985), "Inertia, Gravitation and Metaphysics"
11. Synge (1960a), *Relativity: The General Theory*
12. Torretti (1984), *Relativity and Geometry*: chs. V–VI

6.2 Week 14: Diffeomorphism Invariance; Substantivalism versus Relationalism (Feb. 03)

Required Reading

1. Curiel (2009), "General Relativity Needs No Interpretation"
2. Einstein (1922a), "Geometry and Experience"
3. Pooley (2013), "Substantivalist and Relationalist Approaches to Spacetime"

Suggested Reading

1. Belot (1996), "Why General Relativity *Does* Need an Interpretation"
2. Belot (1999), "Rehabilitating Relationalism"
3. Butterfield (1989), "The Hole Truth"
4. DiSalle (1995), "Spacetime Theory as Physical Geometry"
5. DiSalle (1994), "On Dynamics, Indiscernibility, and Spacetime Ontology"
6. DiSalle (2006b), *Understanding Space-Time: The Philosophical Development of Physics from Newton to Einstein*: ch. 4, §§6–7
7. Dorato (2000), "Substantivalism, Relationism, and Structural Spacetime Realism"
8. Earman (1989b), *World Enough and Space-Time*: chs. 8–9
9. Earman (2006), "The Implications of General Covariance for the Ontology and Ideology of Spacetime"
10. Friedman (1983), *Foundations of Space-Time Theories*: chs. VI–VII
11. Hoefer (1996), "The Metaphysics of Space-Time Substantivalism"
12. Hoefer (1998), "Absolute versus Relational Spacetime: For Better or Worse, the Debate Goes On"
13. Maudlin (1993), "Buckets of Water and Waves of Space: Why Spacetime Is Probably a Substance"
14. Pooley (2006), "Points, Particles and Structural Realism"
15. Saunders and Brown (1991), *The Philosophy of Vacuum*
16. Sklar (1976), *Space, Time and Spacetime*: ch. 3, §§E–F

7 FINAL PAPER DUE, 21 MARCH 2016

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Belot, G. (1996, September). Why general relativity *does* need an interpretation. *Philosophy of Science 63, Supplement: Proceedings of the 1996 Biennial Meetings of the Philosophy of Science Association. Part I: Contributed Papers*, S80–S88. Stable URL: http://www.jstor.org/stable/188514.

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Cohen, I. and G. Smith (Eds.) (2004). *The Cambridge Companion to Newton*. Cambridge: Cambridge University Press.

Cohen, I. B. (2004). Newton's concepts of force and mass, with notes on the Laws of Motion. See Cohen and Smith (2004), Chapter 2, pp. 57–84.

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Dieks, D. (2006a). Becoming, relativity and locality. See Dieks (2006b), Chapter 8, pp. 157–176.

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