Hellems Building, Office 282
CU Boulder, Dept of Philosophy
Boulder, CO 80309

zee.perry@nyu.edu
(215)-262-3126
www.zrperry.com

Zee R. Perry

curriculum vitae

Employment

2018–present *Center Visiting Scholar*
Center for the Study of Origins, University of Colorado, Boulder

2018–present *Visiting Instructor*
Department of Philosophy, University of Colorado, Boulder

2016–2018 *Andrew W. Mellon Foundation Postdoctoral Associate*
Department of Philosophy, Rutgers University, New Brunswick

Education

2009–2016 Ph.D. in Philosophy, New York University.
Dissertation: *Physical Quantities: Mereology and Dynamics*
Committee: Tim Maudlin (chair), Cian Dorr, Hartry Field, Shamik Dasgupta (external, Princeton)

2007–2009 B.A. in Philosophy, Rutgers University *Summa Cum Laude*.

2005–2007 Moravian College

Areas of Specialization

Metaphysics, Philosophy of Physics

Areas of Competence

Philosophy of Science, Philosophy of Art, Logic

Fellowships and Awards

Summer 2019 Early Career Researcher Visiting Fellowship, ANU School of Philosophy and Centre for the Philosophy of the Sciences

2018–present Visiting Scholarship Award (Project: Origins of Measurement), Center for the Study of Origins, CU Boulder

2015–2016 Mellon Dissertation Fellowship, NYU

2015 Student Senator's Council Conference Funding Travel Award, NYU

2015 Outstanding Teaching Award, NYU

2014 Graduate School of Arts and Sciences Dean's Student Travel Grant, NYU

2009–2014 MacCracken Fellowship, NYU

Publications

2017 "How to be a Substantivalist Without Getting Shifty About It". *Philosophical Issues:* Metaphysics. 27, (1). (2017). http://philpapers.org/rec/PERHTB

2017 "What the Humean Should Say about Entanglement" (with Harjit Bhogal). *Noûs.* 51, (1). (2017). http://philpapers.org/rec/BHOWTH

2015 "Properly Extensive Quantities". *Philosophy of Science.* University of Chicago Press. 82, (5). (2015). http://philpapers.org/rec/PERPEQ

Under Review

"On Mereology and Metricality"
"Does Physics Motivate a Dynamic Theory of Quantity?"

Papers In Progress

"Humean Nomic Essentialism" (with Harjit Bhogal)
"Nothing in the Rule Book says a Dog Can't Play Basketball; Two Ways the Laws of Nature Might Govern"
"Governing Laws and Nomological Modality"
"There's no Speed of Light, So What the Heck did Michelson Measure?"
"What the Humean Should Say About Quantities: A Reply to Bricker"

Presentations and Commentaries ('I'=Invited)

Jun 2019 "Does Physics Motivate a Dynamic Theory of Quantity?" Centre for the Philosophy of the Sciences. Australian National University. (I)

Jun 2019 "Nothing in the Rule Book says a Dog Can't Play Basketball" FraMEPhys Workshop on Grounding and the Laws of Nature. Birmingham University. (I)

May 2019 "Against Quantitative Primitivism: On Mereology and Metricality" Numbers, Minds, and Magnitudes Workshop. New College of the Humanities. (I)

May 2019 Comment on: "Chance Explanation" by Katrina Elliott at Metaphysics and its History: Regress Arguments. Simon Fraser University. (I)

Apr 2019 "Nothing in the Rule Book says a Dog Can't Play Basketball" Society for the Metaphysics of Science (SMS) Group Session at Pacific Meeting of the American Philosophical Association. (I)

Jan 2019 Comment on: "Terminating Fundamental Determinables and Denying Determinable-Based Accounts of Metaphysical Indeterminacy" by Jannai Shields at Eastern Meeting of the American Philosophical Association. (I)

Aug 2018 "On Mereology and Metricality" Society for the Metaphysics of Science 2018 Annual Meeting. University of Milan.

Aug 2018 Comment on: "Machian Comparativism about Mass" by Neils Martens at Society for the Metaphysics of Science 2018. University of Milan. (I)

Department Talks:

Feb 2018 "Motivating a Dynamic Theory of Quantity" Stanford University, Philosophy. (I)

Feb 2018 "Motivating a Dynamic Theory of Quantity" Cornell University, Philosophy. (I)

Jan 2018 "Motivating a Dynamic Theory of Quantity" University of Toronto, Philosophy. (I)

Jan 2018 "Motivating a Dynamic Theory of Quantity" National University of Singapore, Philosophy. (I)

Oct 2017 "Motivating a Dynamic Theory of Quantity" Society for the Metaphysics of Science 2017 Meeting. Fordham University.

Dec 2015 "Substantivalism without the Shiftiness: Or, Priority Monism about Spacetime" Early Career Women in Metaphysics Workshop. Fordham University. (I)

Dec 2015 "How to be a Substantivalist Without Getting all Shifty About it" Causation and Modality Workshop. University College London. (I)

Dec 2015 "How to be a Substantivalist Without Getting all Shifty About it" Conference on Fundamentality. City University of New York (CUNY) Graduate Center. (I)

July 2015 "Substantivalism Without the Shiftiness" Metaphysics of Science Summer School at Helsinki University.

Fall 2014 "Intensive and Extensive Quantities" Biennial Meeting of the Philosophy of Science Association. Chicago, IL.

July 2014 "Intensive and Extensive Quantities" British Society for the Philosophy of Science. Cambridge, UK.

May 2015 "Additivity and Dynamics" The Metaphysics of Quantity Conference. New York University. (I)

Spring 2014 "Quantities, Measurement, and Mereology" Yale MAP (Minorities and Philosophy) Speaker Series. (I)

Fall 2013 Comment on: "Fundamental Properties of Fundamental Properties" by Maya Eddon at NYSWIP Tribute to Ruth Barcan Marcus. (I)

Spring 2013 Comment on: "Quantum Entanglement, Bohmian Mechanics, and Humean Supervenience" by Elizabeth Miller at NYU-Columbia Graduate Student Conference. (I)

Spring 2013 "Concatenating Intensive Quantities" New York Metaphysics Bootcamp. Fall 2012. (I) & NYU Dissertation Seminar. (I)

Spring 2012 "The Counterfactual Account of Interactive Art" NYU Washington Square Circle. (I)

Teaching

as Instructor

Fall 2019 Introduction to Philosophy, CU Boulder

Spring 2019 Aesthetics and Philosophy of Art Seminar, CU Boulder

Fall 2018 History of Science: Ancients to Newton, CU Boulder

Fall 2018 Major Social Theories (Social & Political Philosophy), CU Boulder

Fall 2018 Contemporary Social Issues (Intro to Practical Ethics), CU Boulder

Fall 2017 Philosophy of Physics: Quantum Mechanics, Rutgers University

Spring 2017 Philosophy of Physics: Space and Time, Rutgers University

Fall 2016 Introduction to Symbolic Logic, Rutgers University

Summer 2013 Metaphysics, NYU
Summer 2012 Aesthetics, NYU

as Preceptor (Teaching Assistant)

Spring 2015 Philosophy of Physics (with Tim Maudlin)
Spring 2013 Ancient Philosophy (with Johnny Cottrell)
Fall 2012 Central Problems In Philosophy (with Helen Yetter Chappel)
Spring 2012 Central Problems In Philosophy (with Katie Elliot)
Fall 2011 Philosophy of Biology (with Laura Franklin-Hall)

Professional Service

2019 Organizer, Pacific APA Group Session — Society for the Metaphysics of Science

2018 Member, Program Committee — 2018 Annual Meeting
Society for the Metaphysics of Science

2013–Present PhilPapers.org "Quantities" category editor, 2013-Present

April 30–May 1, 2016 Advisory Committee, Fordham Early Career Women in Metaphysics Workshop
Organizer: Amy Seymour (Fordham University)
http://fordhammetaphysicsworkshop.weebly.com

2015–2016 New York Co-Organizer (with Simona Aimar and Zack Al-Witri), New York Topics in Metaphysics ("TiM") Workshop, NYU/Barnard/Columbia.

May 1–3 2015 Co-Organizer (with Erica Shumener), New York Metaphysics of Quantity Conference, NYU/New York Institute of Philosophy. quantitiesconference.wordpress.com

2013–2014 Rutgers Cosmology Project, Graduate Assistant Organizer and Co-moderator of Cosmology Project blog: http://philocosmology.com/

2011–2013 New York "Metaphysics Bootcamp" Workshop, Co-Founder and Organizer.

Reading Groups Organized or Co-Organized:

Metaphysics (Causation), Metaphysics of Quantity, Philosophy of Science (Space and Time), Philosophy of Science (General), Aesthetics

Refereeing for:

Philosophy of Science, *Mind*, *Synthese*, *Foundations of Physics*, *The British Journal for the Philosophy of Science*

Departmental Service

2013–2015 Diversity, Inclusivity, and Climate Committee, NYU
2013–2014 Colloquium Committee, NYU
2012–2013 Curriculum Committee, NYU
2014 NYU Prospective Student Visit, Co-organizer
2010 NYU-Columbia Graduate Student Conference, Co-organizer

2010–2014 NYU-Columbia Graduate Student Conference, Referee

Graduate Courses

Associated Writing (Logic, Ontology and Mathematics) – Hartry Field, NYU
Hyperintensional Metaphysics – Shamik Dasgupta, Princeton.
Aesthetic Psychology – Jesse Prinz, CUNY.

Associated Writing (Quantities) – Ted Sider, NYU
Topics in Metaphysics (Fundamentality) – Karen Bennett, NYU.
Kant's Critique of Judgement – Beatrice Longuenesse, NYU.
Topics in Philosophy of Physics – Tim Maudlin, Rutgers.
Classical and Non-Classical Logics – Hartry Field, NYU.

Advanced Introduction to Philosophy of Language – Imogen Dickie, NYU.
Philosophy of the High Level Sciences – Michael Strevens, NYU.
Proseminar – Instructors: (Fall) Ted Sider and Hartry Field; (Spring) Paul Horwich and Beatrice Longuenesse, NYU.

Classics in Aesthetics – Peter Kivy, Rutgers.

References

Please contact Anupum Mehrotra (am3565@nyu.edu) to request references.

Tim Maudlin
Professor of Philosophy
New York University
am3565+Maudlin@nyu.edu

Cian Dorr
Professor of Philosophy
New York University
am3565+Dorr@nyu.edu

Brian Talbot (teaching)
Assistant Professor of Philosophy
University of Colorado, Boulder
am3565+Talbot@nyu.edu

Hartry Field
University Professor and
Silver Professor of Philosophy
New York University
am3565+Field@nyu.edu

Shamik Dasgupta
Associate Professor
of Philosophy
UC Berkeley
am3565+Dasgupta@nyu.edu

Dissertation Summary

Title: *Physical Quantities: Mereology and Dynamics*

Zee R. Perry

Physical quantities—things like length, mass, charge, and volume—are commonly represented in science and everyday practice with mathematical entities, like numbers and vectors. We explain why I cannot reach the iced coffee 3ft away from me on the table by citing the fact that my arm is 2.5ft long and $2.5 < 3$. However, we don't think that the '$<$' relation between the numbers 2.5 and 3 is directly explaining anything about my arm and the coffee. Rather, this mathematical fact explains indirectly by representing some directly explanatory *physical* feature of the system *itself*. A satisfactory account of the physical world should give us an understanding of the underlying physical structure in virtue of which these mathematical representations are successful. In my dissertation, I defend a two-pronged account of quantity that analyzes this structure in terms of how that quantity traffics with the rest of the physical world. In the first half (Chapters 1 and 2), I argue that, for some quantities—which I call "properly extensive"—this structure is grounded in their relationship to the *parthood*. The second half (Chapters 3 and 4) concerns the relation between physical quantities and dynamics, and argues that all *other* quantities have their structure only derivatively, in virtue of their dynamical connections to properly extensive quantities according to the physical laws.

There is a commonly accepted distinction between *intensive* quantities (like density or temperature), for which the temperature, say, of a whole is, in general, not the "sum" of the temperatures of its parts, and *extensive* quantities which *are* additive in this way. In Chapter 1, I argue that there are more ways a quantity can impact what parts an object can have, or what those parts must be like, than what's captured by the intensive/extensive distinction, and introduce the notion of a *properly extensive* quantity. Quantities like mass and charge are extensive but not *properly* so, since they are "additive" but not "subtractive": *If* an object can be divided into massive parts, then its mass must be the "sum" of the masses of those parts. However, the converse is not necessarily true: A muon, for instance, has a greater mass than an electron but has *no* part as massive as that electron (since they are both fundamental particles). In contrast, length is *properly extensive*: A line's length is the "sum" of l_α and l_β if *and only if* it is divisible into two parts of length l_α and l_β respectively. Quantities like length, volume, and temporal duration are, I argue, properly extensive.

Chapter 2 defends an account of these quantities according to which predicates like "shorter than" and "(not as long as, but) as long as a part of" are not just necessarily coextensive (as established in Chapter 1), they're expressions of the *same relation*. I call this the Mereological-Reductive (M-R) account of properly extensive quantities, and present the M-R account of volume in formal detail. The account defines the relations that constitute volume's quantitative structure in terms of mereological relations and the sharing of intrinsic volume properties. I give mereological definitions for volume ordering and summation relations as well as a schema for the many volume *ratio relations*, like "n-times the volume of". I show that this definition schema extends to capture even *irrational* volume ratios, like "π-times the volume of". The M-R account's definitions necessarily satisfy all the formal features needed to justify representation with real numbers, and

they do justice to the intuition that volume ordering, summation, and ratio relations are *intrinsic* to their relata. In contrast, I argue that competing theories of quantitative structure, like those defended by Field (1984) and Mundy (1987), cannot give a fully general account of volume metric relations without giving up intrinsicality.

Chapters 3 and 4 concern quantities which are not properly extensive, like mass, charge, temperature, density, etc. We cannot ground these quantities' structure in the physical makeup of their instances (as the M-R account in Chapter 2 does for properly extensive ones) because their quantitative structure is not reflected in the parthood structure of their instances: e.g., two massive point particles may stand in the "π-times as massive as", or the "twice as massive as" or any of countless other mass metric relations, despite both having no proper parts.

Chapter 3 takes this point further, arguing that accounts on which mass's additivity is *not* dependent on (or otherwise determined by) the *dynamics of massive bodies* are committed to a pervasive explanatory failure. Such accounts, I argue, require widespread unexplained correlations between the mass properties instantiated by composite bodies and those bodies' law-governed dynamic behavior. For instance, mass additivity explains why a body composed of two particles weighing 2g and 3g, respectively, *instantiates* the property 5g. And the dynamical laws can explain why that same composite body *behaves* roughly like a 5g *simple* particle. But (if additivity is fundamental) these two explanations will have almost *no* overlap, leaving us no means to explain their correspondence. The second half of the chapter extends this explanatory worry, arguing that the very same considerations apply to aspects of mass's *quantitative structure*, namely mass summation structure (in virtue of which one mass property is said to be the "sum" of two others). This gives rise to a new and powerful worry for certain popular accounts of the fundamental structure of physical quantities—most notably the position of Mundy (1987) and Eddon (2013).

Chapter 4 argues that the best chance for a viable account of non-properly extensive quantities ('non-' takes wide scope) requires a hierarchical picture—i.e. one where we define one quantity's structure in terms of some *other* quantity, whose structure is taken as given. Specifically, I defend an account which grounds the structure of non-properly extensive quantities in their dynamical connections to the properly extensive ones, as established by the physical laws. Here the difference between cases where, e.g., a pair of point particles stand in "π-times as massive as" and one where they stand in "twice as massive as" is determined by the degree of difference in the accelerations they undergo when impressed by forces of the same strength. I show how this can be done, and respond to arguments like those of McKinsey, Sugar, and Suppes (1953) which purport to show that classical mass cannot be defined in terms of the other primitives of Newtonian mechanics without ruling out or conflating distinct physical possibilities.

Works Cited in Summary

[1] Eddon, Maya (2013). "Fundamental Properties of Fundamental Properties". In Karen Bennett Dean Zimmerman (ed.), *Oxford Studies in Metaphysics, Volume 8*. 78–104.

[2] Field, Hartry (1984). "Can We Dispense with Space-Time?" *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association 1984*: 33 - 90.

[3] J. C. C. McKinsey, A. C. Sugar, and Suppes, Patrick (1953). "Axiomatic Foundations of Classical Particle Mechanics". *Journal of Rational Mechanics and Analysis* Vol. 2, No. 2, 1953

[4] Mundy, Brent (1987). "The Metaphysics of Quantity". Philosophical Studies 51 (1): 29 – 54. 1987