# Acknowledgments

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The research presented here has been a collaboration from the outset with members of our Cognition and Learning in Interdisciplinary Cultures (CLIC) research group. It is impossible to disentangle their individual

contributions, but I do credit specific analyses, based on coauthored publications, within the chapters of the book. The CLIC research group constituted our own complex distributed cognitive-cultural system, which varied in membership and configuration over the course of fifteen years to comprise, ultimately, forty researchers with a wide range and variety of backgrounds. Our research discussions were not only spirited and intellectually stimulating, but also fun. As colleagues often remarked, much laughter floated down the corridor during these meetings. We did, indeed, "click," through many changes of membership. I single out the primary, long-term members from whom I learned so much for special acknowledgement. I thank my co-PI, Wendy Newstetter, for helping to make me a better ethnographer, and our initial postdoc, Elke-Kurz Milcke, for helping us to establish our interview, observational, and coding procedures. As research scientist across all the projects, Lisa Osbeck helped us all learn to use qualitative methods, especially coding and thematic analysis, and to develop evaluations. She also initiated a line of research contributions to social and theoretical psychology. As postdoctoral researchers, Sanjay Chandrasekharan helped to articulate distributed cognition as it might be applied to science, and Miles MacLeod, to develop our contributions to philosophy of biological science and engineering. All these senior researchers are highly creative, talented, insightful, and dedicated researchers, as are our student researchers. Jim Davies was the primary graduate student on the BME project, and Vrishali Subramanian, on the ISB project. Our main undergraduate researchers on the BME project were Ellie Harmon and Christopher Patton, who stayed with us through their MS degrees, and Joshua Jameson, on the ISB project. Each of the student researchers conducted numerous interviews, collected field observations, and taught us the details of the lab technologies they were learning about, all while—it should be noted—they were conducting their own dissertation or thesis research on different topics in their background fields of computer science, public policy, or industrial design. There are no philosophy or cognitive science degrees at Georgia Tech, and so we gathered student researchers from the courses I taught. Wendy and I were responsible for how the project started out, but we could not have envisioned what it would become through the contributions of this creative and energetic group of researchers. Only as I have been able to stand back and reflect, have I come to realize, fully, the range and complexity of the problems they enabled us to attack and how necessary they all were to making progress.

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Some sections of the book draw from previously published material: "Creating Cognitive-Cultural Scaffolding in Interdisciplinary Research Laboratories," in *Beyond the Meme: Development and Structure in Cultural Evolution*, edited by A. C. Love and W. C. Wimsatt, 64–94, Minnesota Studies in the Philosophy of Science 22 (Minneapolis: University of Minnesota Press, 2019); "Interdisciplinarities in Action: Cognitive Ethnography of Bioengineering

Sciences Research Laboratories," *Perspectives on Science* 27 (2019): 553–581; "Hybrid Devices: Embodiments of Culture in Biomedical Engineering," in *Cultures without Culturalism*, edited by K. Chemla and E. F. Keller, 117–144 (Durham, NC: Duke University Press, 2017); "Engineering Concepts: The Interplay between Concept Formation and Modeling Practices in Bioengineering Sciences," *Mind, Culture, & Activity* 19 (2012): 222–239; "Modeling Practices in Conceptual Innovation: An Ethnographic Study of a Neural Engineering Research Laboratory," in *Scientific Concepts and Investigative Practice*, edited by U. Feest and F. Steinle, 245–269 (Berlin: DeGruyter, 2012); M. MacLeod and N. J. Nersessian: "Mesoscopic Modeling as a Cognitive Strategy for Handling Complex Biological Systems," *Studies in the History and Philosophy of the Biological and Biomedical Science* 19 (78): 101201 (2019, with Miles MacLeod); "Modeling Complexity: Cognitive Constraints and Computational Model-Building in Integrative Systems Biology," *History and Philosophy of the Life Sciences* 40 (2018): 70 (with Miles MacLeod); "Building Cognition: The Construction of Computational Representations for Scientific Discovery," *Cognitive Science* 39 (2015): 1727–1763 (with Sanjay Chandrasekharan); "Building Simulations from the Ground Up: Modeling and Theory in Systems Biology," *Philosophy of Science* 80 (2013): 533–556 (with Miles MacLeod); and "Coupling Simulation and Experiment: The Bimodal Strategy in Integrative Systems Biology," *Studies in the History and Philosophy of the Biological and Biomedical Sciences* 44 (online 9/13/13): 572–584 (with Miles MacLeod).

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learning, and to use design-based research to work with faculty to translate our findings into classrooms and instructional laboratories rooted in authentic practices in these emerging fields. Nora Sabelli and Elizabeth VanderPutten saw the potential in an unusual proposal to conduct basic research on graduate student researchers in laboratories on the frontiers of biomedical engineering. They took a chance on us and awarded a grant deemed "high risk, potentially transformative." Without that grant the project could never have gotten off the ground. Gregg Solomon joined NSF near the end of the first grant and guided us through the next project, in which we proposed to continue to examine frontier experimental practices, this time with the aim of transforming the customary recipe-like instructional lab into one more closely aligned with research practices. Throughout, he provided opportunities for me to promote and showcase our research across NSF, for which I am grateful. Janice Earle provided support for our final grant, which focused on research and learning in a different kind of interdisciplinary frontier, integrative systems biology. The opinions expressed in this book are my own and do not reflect those of the NSF.

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# Interdisciplinarity in the Making

## Models and Methods in Frontier Science

By: Nancy J. Nersessian

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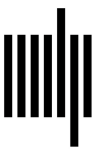

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