

Toward A History Of Epistemic Things Synthesizing Proteins In The Test Tube Writing Science

Triumphalists see their world view as the ultimate repository of spiritual truth: all other world views are inferior and their adherents need to be converted forcefully, or silenced, or destroyed to prevent their cancerous views from metastasizing. Triumphalism has infected too many of the adherents in the Abrahamic religious traditions, and must be neutralized by the growth of epistemic humility using a tactic like the five step strategy suggested in this book.

A free open access ebook is available upon publication. Learn more at www.luminosoa.org. How do victims and perpetrators generate conflicting knowledge about genocide? Using a sociology of knowledge approach, Savelsberg answers this question for the Armenian genocide committed in the context of the First World War. Focusing on Armenians and Turks, he examines strategies of silencing, denial, and acknowledgment in everyday interaction, public rituals, law, and politics. Drawing on interviews, ethnographic accounts, documents, and eyewitness testimony, Savelsberg illuminates the social processes that drive dueling versions of history. He reveals counterproductive consequences of denial in an age of human rights hegemony, with implications for populist disinformation campaigns against overwhelming evidence.

Arguing for the primacy of the material arrangements of the laboratory in the dynamics of modern molecular biology, the author develops a new epistemology of experimentation in which research is treated as a process for producing epistemic things.

An Epistemology of the Concrete brings together case studies and theoretical reflections on the history and epistemology of the life sciences by Hans-Jörg Rheinberger, one of the world's foremost philosophers of science. In these essays, he examines the history of experiments, concepts, model organisms, instruments, and the gamut of epistemological, institutional, political, and social factors that determine the actual course of the development of knowledge. Building on ideas from his influential book *Toward a History of Epistemic Things*, Rheinberger first considers ways of historicizing scientific knowledge, and then explores different configurations of genetic experimentation in the first half of the twentieth century and the interaction between apparatuses, experiments, and concept formation in molecular biology in the second half of the twentieth century. He delves into fundamental epistemological issues bearing on the relationship between instruments and objects of knowledge, laboratory preparations as a special class of epistemic objects, and the note-taking and write-up techniques used in research labs. He takes up topics ranging from the French "historical epistemologists" Gaston Bachelard and Georges Canguilhem to the liquid scintillation counter, a radioactivity measuring device that became a crucial tool for molecular biology and biomedicine in the 1960s and 1970s. Throughout *An Epistemology of the Concrete*, Rheinberger shows how assemblages—historical conjunctures—set the conditions for the emergence of epistemic novelty, and he conveys the fascination of scientific things: those organisms, spaces, apparatuses, and techniques that are transformed by research and that transform research in turn.

The cultural history of heredity: scholars from a range of disciplines discuss the evolution of the concept of heredity, from the Early Modern understanding of the act of "generation" to its later nineteenth-century definition as the transmission of characteristics across generations. Until the middle of the eighteenth century, the biological makeup of an organism was ascribed to an individual instance of "generation"--involving conception, pregnancy, embryonic development, parturition, lactation, and even astral influences and maternal mood--rather than the biological transmission of traits and characteristics. Discussions of heredity and inheritance took place largely in the legal and political sphere. In *Heredity Produced*, scholars from a broad range of disciplines explore the development of the concept of heredity from the early modern period to the era of Darwin and Mendel. The contributors examine the evolution of the concept in disparate cultural realms--including law, medicine, and natural history--and show that it did not coalesce into a more general understanding of heredity until the mid-nineteenth century. They consider inheritance and kinship in a legal context; the classification of certain diseases as hereditary; the study of botany; animal and plant breeding and hybridization for desirable characteristics; theories of generation and evolution; and anthropology and its study of physical differences among humans, particularly skin color. The editors argue that only when people, animals, and plants became more mobile--and were separated from their natural habitats through exploration, colonialism, and other causes--could scientists distinguish between inherited and environmentally induced traits and develop a coherent theory of heredity. Contributors David Sabeau, Silvia De Renzi, Ulrike Vedder, Carlos López Beltrán, Phillip K. Wilson, Laure Cartron, Staffan Müller-Wille, Marc J. Ratcliff, Roger Wood, Mary Terrall, Peter McLaughlin, François Duchesneau, Ohad Parnes, Renato Mazzolini, Paul White, Nicolas Pethes, Stefan Willer, Helmuth Müller-Sievers

This book, first published in 2000, explores a range of diverse issues in the intersection of biology and epistemology.

This volume examines the connections between technological change and its knowledge base, focusing in particular on Europe during the Industrial Revolution.

The historiography of timekeeping is traditionally characterized by a dichotomy between research that investigates the evolution of technical devices on the one hand, and research that is concerned with the examination of the cultures and uses of time on the other hand. *Material Histories of Time* opens a dialogue between these two approaches by taking monumental clocks, table clocks, portable watches, carriage clocks, and other forms of timekeeping as the starting point of a joint reflection of specialists of the history of horology together with scholars studying the social and cultural history of time. The contributions range from the apparition of the first timekeeping mechanical systems in the Middle Ages to the first evidence of industrialization in the 18th and 19th centuries.

In a world overwhelmingly unjust and seemingly deprived of alternatives, this book claims that the alternatives can be found among us. These alternatives are, however, discredited or made invisible by the dominant ways of knowing. Rather than alternatives, therefore, we need an alternative way of thinking of alternatives. Such an alternative way of thinking lies in the knowledges born in the struggles against

capitalism, colonialism, and patriarchy, the three main forms of modern domination. In their immense diversity, such ways of knowing constitute the Global South as an epistemic subject. The epistemologies of the South are guided by the idea that another world is possible and urgently needed; they emerge both in the geographical north and in the geographical south whenever collectives of people fight against modern domination. Learning from and with the epistemic South suggests that the alternative to a general theory is the promotion of an ecology of knowledges based on intercultural and interpolitical translation.

The development of an epistemology that explains how science and art embody and convey understanding. Philosophy valorizes truth, holding that there can never be epistemically good reasons to accept a known falsehood, or to accept modes of justification that are not truth conducive. How can this stance account for the epistemic standing of science, which unabashedly relies on models, idealizations, and thought experiments that are known not to be true? In *True Enough*, Catherine Elgin argues that we should not assume that the inaccuracy of models and idealizations constitutes an inadequacy. To the contrary, their divergence from truth or representational accuracy fosters their epistemic functioning. When effective, models and idealizations are, Elgin contends, felicitous falsehoods that exemplify features of the phenomena they bear on. Because works of art deploy the same sorts of felicitous falsehoods, she argues, they also advance understanding. Elgin develops a holistic epistemology that focuses on the understanding of broad ranges of phenomena rather than knowledge of individual facts. Epistemic acceptability, she maintains, is a matter not of truth-conduciveness, but of what would be reflectively endorsed by the members of an idealized epistemic community—a quasi-Kantian realm of epistemic ends.

How deeply into the structure of physical reality do the effects of our way of representing it reach? To what extent do constructivist accounts of scientific theorizing involve realist assumptions, and vice versa? This book provides a lucid and concise introduction to contemporary debates, taking as its theme the question of the relationship of representation and reality. It treats in an attractive and accessible way the historical, philosophical, and literary aspects of this question. In particular, it explores how the present relates to and configures claims to scientific knowledge from the past, taking as its main case study *On the Nature of Things* (*De Rerum Natura*), the poem on physics written by the Roman poet Lucretius in the 50s B.C.E. The book engages in a sustained argument about realist assumptions in scientific and other discourses through detailed analysis and discussion of some of the most important recent contributions to this debate. Engaging sympathetically but not uncritically with constructivist accounts of scientific knowledge, the book takes up a sustained critique of recent contributions to that debate, including those of Ian Hacking, Evelyn Fox Keller, Bruno Latour, and Hans-Jrg Rheinberger. What are the implications of regarding such knowledge as "discovered" or "invented"? How is the rhetoric of such claims to be identified and the pretensions of those claims assessed? In what ways can realist and constructivist approaches be reconciled? How do these considerations affect the way we read scientific texts from the past and regard them historically? What emerges is a fresh and challenging assessment of the role of time and temporal perspective in assessing claims to knowledge in scientific thought and of the importance of textuality to the history of knowledge. A wide variety of readers, from classicists and intellectual historians to epistemologists of science, will enjoy and learn from *Rethinking Reality*. Duncan Kennedy is Reader in Latin Literature and the Theory of Criticism, University of Bristol. He is also the author of *The Arts of Love: Five Studies in the Discourse of Roman Love Elegy*.

We normally think of viruses in terms of the devastating diseases they cause, from smallpox to AIDS. But in *The Life of a Virus*, Angela N. H. Creager introduces us to a plant virus that has taught us much of what we know about all viruses, including the lethal ones, and that also played a crucial role in the development of molecular biology. Focusing on the tobacco mosaic virus (TMV) research conducted in Nobel laureate Wendell Stanley's lab, Creager argues that TMV served as a model system for virology and molecular biology, much as the fruit fly and laboratory mouse have for genetics and cancer research. She examines how the experimental techniques and instruments Stanley and his colleagues developed for studying TMV were generalized not just to other labs working on TMV, but also to research on other diseases such as poliomyelitis and influenza and to studies of genes and cell organelles. The great success of research on TMV also helped justify increased spending on biomedical research in the postwar years (partly through the National Foundation for Infantile Paralysis's March of Dimes)—a funding priority that has continued to this day.

Interdisciplinary collection of essays on the influence and development of new medical technologies.

By systematically uncovering and comprehensively examining the epistemological implications of Heidegger's history of being and Foucault's archaeology of discursive formations, *Towards an Epistemology of Ruptures* shows how Heidegger and Foucault significantly expand the notions of knowledge and thought. This is done by tracing their path-breaking responses to the question: What is the object of thought? The book shows how for both thinkers thought is not just the act by which the object is represented in an idea, and knowledge not just a state of the mind of the individual subject corresponding to the object. Each thinker, in his own way, argues that thought is a productive event in which the subject and the object gain their respective identity and knowledge is the opening up of a space in which the subject and object can encounter each other and in which true and false statements about an object become possible. They thereby lay the ground for a new conceptual framework for rethinking the very relationship between knowledge and its object.

Abstract and conceptual models have become an indispensable tool for analyzing the flood of highly detailed empirical data generated in recent years by advanced techniques in the biosciences. Scientists are developing new modeling strategies for analyzing data, integrating results into the conceptual framework of theoretical biology, and formulating new hypotheses. In *Modeling Biology*, leading scholars investigate new modeling strategies in the domains of morphology, development, behavior, and evolution. The emphasis on models in the biological sciences has been accompanied by a new focus on conceptual issues and a more complex understanding of epistemological concepts. Contributors to *Modeling Biology* discuss models and modeling strategies from the perspectives of philosophy, history, and applied mathematics. Individual chapters discuss specific approaches to modeling in such domains as biological form, development, and behavior. Finally, the book addresses the modeling of these properties in the context of evolution, with a particular emphasis on the emerging field of evolutionary developmental biology (*evo-devo*). Contributors Giorgio A. Ascoli, Chandrajit Bajaj, James P. Collins, Luciano da Fontoura Costa, Kerstin Dautenhahn, Nigel R. Franks, Scott Gilbert, Marta Ibañez Miguez, Juan Carlos Izpisua-Belmonte, Alexander S. Klyubin, Thomas J. Koehnle, Manfred D. Laubichler, Sabina Leonelli, James A. R. Marshall, George R. McGhee Jr., Gerd B. Müller, Christopher L. Nehaniv, Karl J. Niklas, Lars Olsson, Eirikur Palsson, Daniel Polani, Diego Rasskin Gutman, Hans-Jörg Rheinberger, Alexei V. Samsonovich, Jeffrey C. Schank, Harry B. M. Uylings, Jaap van Pelt, Iain Werry Manfred D. Laubichler is Assistant Professor in the School of Life Sciences at Arizona State University. He is the coeditor of *From Embryology to Evo-Devo* (MIT Press, 2007). Gerd B. Müller is Professor and Head of the Department of Theoretical Biology at the University of Vienna. He is a coeditor of *Origination of Organismal Form* (MIT Press, 2003) and *Environment, Development, Evolution* (MIT Press, 2003).

A comprehensive introduction to the theory of knowledge.

This book explores the epistemic side of racial and sexual oppression. It elucidates how social insensitivities and imposed silences prevent members of different groups from listening to each other.

Philosophy, Science, and History: A Guide and Reader is a compact overview of the history and philosophy of science that aims to introduce students to the groundwork of the field, and to stimulate innovative research. The general introduction focuses on scientific theory change, assessment, discovery, and pursuit. Part I of the Reader begins with classic texts in the history of logical empiricism,

including Reichenbach's discovery-justification distinction. With careful reference to Kuhn's analysis of scientific revolutions, the section provides key texts analyzing the relationship of HOPOS to the history of science, including texts by Santayana, Rudwick, and Shapin and Schaffer. Part II provides texts illuminating central debates in the history of science and its philosophy. These include the history of natural philosophy (Descartes, Newton, Leibniz, Kant, Hume, and du Châtelet in a new translation); induction and the logic of discovery (including the Mill-Whewell debate, Duhem, and Hanson); and catastrophism versus uniformitarianism in natural history (Playfair on Hutton and Lyell; de Buffon, Cuvier, and Darwin). The editor's introductions to each section provide a broader perspective informed by contemporary research in each area, including related topics. Each introduction furnishes proposals, including thematic bibliographies, for innovative research questions and projects in the classroom and in the field. The Structures of Practical Knowledge investigates the nature of practical knowledge – why, how, when and by whom it is codified, and once codified, how this knowledge is structured. The inquiry unfolds in a series of fifteen case studies, which range in focus from early modern Italy to eighteenth century China. At the heart of each study is a shared definition of practical knowledge, that is, knowledge needed to obtain a certain outcome, whether that be an artistic or mechanical artifact, a healing practice, or a mathematical result. While the content of practical knowledge is widely variable, this study shows that all practical knowledge is formally equivalent in following a defined workflow, as reflected in a construction procedure, a recipe, or an algorithm. As explored in the volume's fifteen contributions, there are three levels at which structures of practical knowledge may be understood and examined. At the most immediate level, there are the individual workflows that encompasses practical knowledge itself. Probing further, it is possible to examine the structure of practical knowledge as it is externalized and codified in texts, drawings, and artifacts such as models. Finally, practical knowledge is also related to social structures, which fundamentally determine its dissemination and evolution into new knowledge structures. The social structures of professionals and institutions represent the critical means by which practical knowledge takes form. These actors are the agents of codification, and by means of selection, appropriation, investment, and knowledge development, they determine the formation of new structures of practical knowledge. On a more abstract level, the creation of new knowledge structures is understood as constituting the basis for the further development of scientific knowledge. Rich in subject matter and incisive in the theory it lays out, this volume represents an important contribution to the history of science and epistemology. Individually, the fifteen case studies – encompassing the history of architecture, mining, brewing, glass production, printing, ballistics, mechanics, cartography, cosmology and astronomy – are replete with original research, and offer new insights into the history of science. Taken together, the contributions remodel historical epistemology as a whole, elucidating the underlining knowledge structures that transcend disciplinary boundaries, and that unite practitioners across time and space. In the era of information and communication, issues of misinformation and miscommunication are more pressing than ever. Epistemic injustice - one of the most important and ground-breaking subjects to have emerged in philosophy in recent years - refers to those forms of unfair treatment that relate to issues of knowledge, understanding, and participation in communicative practices. The Routledge Handbook of Epistemic Injustice is an outstanding reference source to the key topics, problems and debates in this exciting subject. The first collection of its kind, it comprises over thirty chapters by a team of international contributors, divided into five parts: Core Concepts Liberatory Epistemologies and Axes of Oppression Schools of Thought and Subfields within Epistemology Socio-political, Ethical, and Psychological Dimensions of Knowing Case Studies of Epistemic Injustice. As well as fundamental topics such as testimonial and hermeneutic injustice and epistemic trust, the Handbook includes chapters on important issues such as social and virtue epistemology, objectivity and objectification, implicit bias, and gender and race. Also included are chapters on areas in applied ethics and philosophy, such as law, education, and healthcare. The Routledge Handbook of Epistemic Injustice is essential reading for students and researchers in ethics, epistemology, political philosophy, feminist theory, and philosophy of race. It will also be very useful for those in related fields, such as cultural studies, sociology, education and law.

Thomas S. Kuhn's 'The Structure of Scientific Revolutions' was a watershed event when it was published in 1962, upending the previous understanding of science as a slow, logical accumulation of facts and introducing, with the concept of the 'paradigm shift,' social and psychological considerations into the heart of the scientific process. The essays in this book exhume important historical context for Kuhn's work, critically analyzing its foundations in twentieth-century science, politics and Kuhn's own intellectual biography.

In this book it explores science and technology, makes connections between these epistemic, cultural, and political trends, and develops profound insights into the nature of our postmodernity. Edited by an international team of leading scholars, The Routledge Handbook of Social Epistemology is the first major reference work devoted to this growing field. The Handbook's 46 chapters, all appearing in print here for the first time, and written by philosophers and social theorists from around the world, are organized into eight main parts: Historical Backgrounds The Epistemology of Testimony Disagreement, Diversity, and Relativism Science and Social Epistemology The Epistemology of Groups Feminist Epistemology The Epistemology of Democracy Further Horizons for Social Epistemology With lists of references after each chapter and a comprehensive index, this volume will prove to be the definitive guide to the burgeoning interdisciplinary field of social epistemology.

This book explores the concept of 'cognitive injustice': the failure to recognise the different ways of knowing by which people across the globe run their lives and provide meaning to their existence. Boaventura de Sousa Santos shows why global social justice is not possible without global cognitive justice. Santos argues that Western domination has profoundly marginalised knowledge and wisdom that had been in existence in the global South. She contends that today it is imperative to recover and valorize the epistemological diversity of the world. Epistemologies of the South outlines a new kind of bottom-up cosmopolitanism, in which conviviality, solidarity and life triumph against the logic of market-ridden greed and individualism.

The literary and scientific renaissance that struck Germany around 1800 is usually taken to be the cradle of contemporary humanism. Posthumanism in the Age of Humanism shows how figures like Immanuel Kant and Johann Wolfgang Goethe as well as scientists specializing in the emerging modern life and cognitive sciences not only established but also transgressed the boundaries of the "human." This period so broadly painted as humanist by proponents and detractors alike also grappled with ways of challenging some of humanism's most cherished assumptions: the dualisms, for example, between freedom and nature, science and art, matter and spirit, mind and body, and thereby also between the human and the nonhuman. Posthumanism is older than we think, and the so-called "humanists" of the late Enlightenment have much to offer our contemporary re-thinking of the human.

Are the "culture wars" over? When did they begin? What is their relationship to gender struggle and the dynamics of class? In her first full treatment of postcolonial studies, a field that she helped define, Gayatri Chakravorty Spivak, one of the world's foremost literary theorists, poses these questions from within the postcolonial enclave.

An in-depth look at the intersection of judgment and statistics in baseball Scouting and scoring are considered fundamentally different ways of ascertaining value in baseball. Scouting seems to rely on experience and intuition, scoring on performance metrics and statistics. In Scouting and Scoring, Christopher Phillips rejects these simplistic divisions. He shows how both scouts and scorers rely on numbers, bureaucracy, trust, and human labor in order to make sound judgments about the value of baseball players. Tracing baseball's story from the nineteenth century to today, Phillips explains that the sport was one of the earliest and most consequential fields for the introduction of numerical analysis. New technologies and methods of data collection were supposed to enable teams to quantify the drafting and managing of players—replacing scouting with scoring. But that's not how things turned out. Over the decades, scouting and scoring started looking increasingly similar. Scouts expressed their judgments in highly formulaic ways, using numerical grades and scientific instruments to evaluate players. Scorers drew on moral judgments, depended on human labor to maintain and correct data, and designed

bureaucratic systems to make statistics appear reliable. From the invention of official scorers and Statcast to the creation of the Major League Scouting Bureau, the history of baseball reveals the inextricable connections between human expertise and data science. A unique consideration of the role of quantitative measurement and human judgment, Scouting and Scoring provides an entirely fresh understanding of baseball by showing what the sport reveals about reliable knowledge in the modern world.

This collection of essays explores curiosity from many philosophical perspectives of relevance to various fields and disciplines such as educational studies, epistemology, political philosophy and history of thought. It advances and enriches scholarly research on curiosity while critiquing current approaches to the epistemic desire to know. Its interest in contemporary accounts of curiosity does not entail neglect of the conceptual history of this notion from antiquity to the present. Its focus on cultural and scientific appreciations of curiosity is global rather than local and inclusive of standpoints beyond established divisions such as the “modern versus postmodern” or the “analytic versus continental”. The book offers fresh and unique engagements with what motivates us to ask questions and how this motivation operates from an ethical, cultural and political point of view.

In *Philosophy Within Its Proper Bounds*, Edouard Machery argues that resolving many traditional and contemporary philosophical issues is beyond our epistemic reach and that philosophy should re-orient itself toward more humble, but ultimately more important intellectual endeavors. Any resolution to many of these contemporary issues would require an epistemic access to metaphysical possibilities and necessities, which, Machery argues, we do not have. In effect, then, *Philosophy Within Its Proper Bounds* defends a form of modal skepticism. The book assesses the main philosophical method for acquiring the modal knowledge that the resolution of modally immodest philosophical issues turns on: the method of cases, that is, the consideration of actual or hypothetical situations (which cases or thought experiments describe) in order to determine what facts hold in these situations. Canvassing the extensive work done by experimental philosophers over the last 15 years, Edouard Machery shows that the method of cases is unreliable and should be rejected. Importantly, the dismissal of modally immodest philosophical issues is no cause for despair - many important philosophical issues remain within our epistemic reach. In particular, reorienting the course of philosophy would free time and resources for bringing back to prominence a once-central intellectual endeavor: conceptual analysis.

Epistemology, as generally understood by philosophers of science, is rather remote from the history of science and from historical concerns in general. Rheinberger shows that, from the late nineteenth through the late twentieth century, a parallel, alternative discourse sought to come to terms with the rather fundamental experience of the thoroughgoing scientific changes brought on by the revolution in physics. Philosophers of science and historians of science alike contributed their share to what this essay describes as an ongoing quest to historicize epistemology. Historical epistemology, in this sense, is not so concerned with the knowing subject and its mental capacities. Rather, it envisages science as an ongoing cultural endeavor and tries to assess the conditions under which the sciences in all their diversity take shape and change over time.

Experts examine new modeling strategies for the interpretation of biological data and their integration into the conceptual framework of theoretical biology, detailing approaches that focus on morphology, development, behavior, or evolution. Abstract and conceptual models have become an indispensable tool for analyzing the flood of highly detailed empirical data generated in recent years by advanced techniques in the biosciences. Scientists are developing new modeling strategies for analyzing data, integrating results into the conceptual framework of theoretical biology, and formulating new hypotheses. In *Modeling Biology*, leading scholars investigate new modeling strategies in the domains of morphology, development, behavior, and evolution. The emphasis on models in the biological sciences has been accompanied by a new focus on conceptual issues and a more complex understanding of epistemological concepts. Contributors to *Modeling Biology* discuss models and modeling strategies from the perspectives of philosophy, history, and applied mathematics. Individual chapters discuss specific approaches to modeling in such domains as biological form, development, and behavior. Finally, the book addresses the modeling of these properties in the context of evolution, with a particular emphasis on the emerging field of evolutionary developmental biology (or evo-devo). Contributors Giorgio A. Ascoli, Chandrajit Bajaj, James P. Collins, Luciano da Fontoura Costa, Kerstin Dautenhahn, Nigel R. Franks, Scott Gilbert, Marta Ibañes Miguez, Juan Carlos Izpisua-Belmonte, Alexander S. Klyubin, Thomas J. Koehnle, Manfred D. Laubichler, Sabina Leonelli, James A. R. Marshall, George R. McGhee Jr., Gerd B. Müller, Chrystopher L. Nehaniv, Karl J. Niklas, Lars Olsson, Eirikur Palsson, Daniel Polani, Diego Rasskin Gutman, Hans-Jörg Rheinberger, Alexei V. Samsonovich, Jeffrey C. Schank, Harry B. M. Uylings, Jaap van Pelt, Iain Werry

As well as including the classic papers from the history of epistemology, this distinctive, wide-ranging anthology provides essential coverage of key contemporary challenges to that tradition.

Ignorance is a neglected issue in philosophy. This is surprising for, contrary to what one might expect, it is not clear what ignorance is. Some philosophers say or assume that it is a lack of knowledge, whereas others claim or presuppose that it is an absence of true belief. What is one ignorant of when one is ignorant? What kinds of ignorance are there? This neglect is also remarkable because ignorance plays a crucial role in all sorts of controversial societal issues. Ignorance is often thought to be a moral and legal excuse; it is a core concept in medical ethics and debates about privacy, and it features in religious traditions and debates about belief in God. This book does not only study an epistemic phenomenon that is interesting in itself, but also provides important tools that can be fruitfully used in debates within and beyond philosophy.

This book, by combining sociocultural, material, cognitive and embodied perspectives on human knowing, offers a new and powerful conceptualisation of epistemic fluency – a capacity that underpins knowledgeable professional action and innovation. Using results from empirical studies of professional education programs, the book sheds light on practical ways in which the development of epistemic fluency can be recognised and supported - in higher education and in the transition to work. The book provides a broader and deeper conception of epistemic fluency than previously available in the literature. Epistemic fluency involves a set of capabilities that allow people to recognize and participate in different ways of knowing. Such people are adept at combining different kinds of specialised and context-dependent knowledge and at reconfiguring their work environment to see problems and solutions anew. In practical terms, the book addresses the following kinds of questions. What does it take to be a productive member of a multidisciplinary team working on a complex problem? What enables a person to integrate different types and fields of knowledge, indeed different ways of knowing, in order to make some well-founded decisions and take actions in the world? What personal knowledge resources are entailed in analysing a problem and describing an innovative solution, such that the innovation can be shared in an organization or professional community? How do people get better at these things; and how can teachers in higher education help students develop these valued capacities? The answers to these questions are central to a thorough understanding of what it means to become an effective knowledge worker and resourceful professional.

What are living bodies made of? Protein modelers tell us that our cells are composed of millions of proteins, intricately folded molecular structures on the scale of nanoparticles. Proteins twist and wriggle as they carry out the activities that keep cells alive. Figuring out how to make these unruly substances visible, tangible, and workable is a challenging task, one that is not readily automated, even by the fastest computers. Natasha Myers explores what protein modelers must do to render three-dimensional, atomic-resolution models of these lively materials. *Rendering Life Molecular* shows that protein models are not just informed by scientific data: model building entangles a modeler’s entire sensorium, and modelers must learn to feel their way through the data in order to interpret molecular forms. Myers takes us into protein modeling laboratories and classrooms, tracking how gesture, affect, imagination, and intuition shape practices of objectivity. Asking, ‘What is life becoming in modelers’ hands?’ she tunes into the

ways they animate molecules through their moving bodies and other media. In the process she amplifies an otherwise muted liveliness inflecting mechanistic accounts of the stuff of life.

How is epistemology related to the issue of teaching science and evolution in the schools? Addressing a flashpoint issue in our schools today, this book explores core epistemological differences between proponents of intelligent design and evolutionary scientists, as well as the critical role of epistemological beliefs in learning science. Preeminent scholars in these areas report empirical research and/or make a theoretical contribution, with a particular emphasis on the controversy over whether intelligent design deserves to be considered a science alongside Darwinian evolution. This pioneering book coordinates and provides a complete picture of the intersections in the study of evolution, epistemology, and science education, in order to allow a deeper understanding of the intelligent design vs. evolution controversy. This is a very timely book for teachers and policy makers who are wrestling with issues of how to teach biology and evolution within a cultural context in which intelligent design has been and is likely to remain a challenge for the foreseeable future.

No part of philosophy is as disconnected from its history as is epistemology. After *Certainty* offers a reconstruction of that history, understood as a series of changing expectations about the cognitive ideal that beings such as us might hope to achieve in a world such as this. The story begins with Aristotle and then looks at how his epistemic program was developed through later antiquity and into the Middle Ages, before being dramatically reformulated in the seventeenth century. In watching these debates unfold over the centuries, one sees why epistemology has traditionally been embedded within a much larger sphere of concerns about human nature and the reality of the world we live in. It ultimately becomes clear why epistemology today has become a much narrower and specialized field, concerned with the conditions under which it is true to say, that someone knows something. Based on a series of lectures given at Oxford University, Robert Pasnau's book ranges widely over the history of philosophy, and examines in some detail the rise of science as an autonomous discipline. Ultimately Pasnau argues that we may have no good reasons to suppose ourselves capable of achieving even the most minimal standards for knowledge, and the final chapter concludes with a discussion of faith and hope.

Both a history and a metahistory, *Representing Electrons* focuses on the development of various theoretical representations of electrons from the late 1890s to 1925 and the methodological problems associated with writing about unobservable scientific entities. Using the electron—or rather its representation—as a historical actor, Theodore Arabatzis illustrates the emergence and gradual consolidation of its representation in physics, its career throughout old quantum theory, and its appropriation and reinterpretation by chemists. As Arabatzis develops this novel biographical approach, he portrays scientific representations as partly autonomous agents with lives of their own. Furthermore, he argues that the considerable variance in the representation of the electron does not undermine its stable identity or existence. Raising philosophical issues of contentious debate in the history and philosophy of science—namely, scientific realism and meaning change—Arabatzis addresses the history of the electron across disciplines, integrating historical narrative with philosophical analysis in a book that will be a touchstone for historians and philosophers of science and scientists alike.

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