R. FRIGG & M. C. HUNTER, eds. 2010. *Beyond Mimesis and Convention: Representation in art and science.* Dordrecht: Springer.

The book edited by Roman Frigg and Matthew C. Hunter is a great example of inter-disciplinary collaborative work, bringing together contributions by scholars of science and of art, around the topic of representation. The collection consists of eleven essays, seven of which were presented in early form at a conference organized by the two editors at the London School of Economics and the Courtauld Institute of Art in June 2006; the other four have been added subsequently. The result is a high-standard, remarkably edited book.

The fundamental assumption of the book is that "representation has generated similar conceptual problems in both fields, largely unbeknownst to the other community" (v). The nature of scientific representation has been one of the most debated questions in the philosophy of science throughout the twentieth century, taking the form of a reflection on the nature of scientific theories. As the editors recall in their lucid introduction to the volume, logical empiricists used to tackle the question as a linguistic one, by wondering about the meaning of theoretical terms. This linguistic approach has been largely criticized since the 1960's, in particular by the advocates of the semantic view of theories. Instead, the latter propose to conceive of scientific representation as a relation of isomorphism, or of similarity, between the mathematical structures (models) described by theories, and the real-word systems they stand for. In turn, the semantic view has received many criticisms in the recent years. Beyond their variety, critics of the semantic view agree on two main points, which together constitute the theoretical motivation, and the methodological grounding of the volume.

First, neither isomorphism, nor similarity, is sufficient to account for the representational relation holding between theories or models and their target systems. Hence, mimesis (or resemblance) is not the right category to think of representation, as already highlighted by Nelson Goodman, who clearly stands as the forerunner of this interdisciplinary enterprise. But "the other extreme end of the spectrum" (xx), which consists in conceiving of representation as a matter of pure convention, is not satisfactory either. The second point agreed on by all critics of the semantic view is that philosophers of science should pay more attention to the concrete details of scientific practice. And this might be a way to overcome the foregoing impasse.

This double move in the philosophy of science quite naturally leads philosophers interested in scientific representation to taking some distance from questions within the discipline, and to adopting a broader perspective on representational practices, in particular by drawing from the study of art. In turn, it is assumed, students of the arts, who are confronting a similar impasse (mimesis vs convention) should benefit from philosophical insights into the cognitive and epistemic status of scientific representation. Hence, the overall aim of the volume is "to make the concerns [students of the science and of the art] share salient", and "to demonstrate the necessity and advantage of rethinking representation together" (xxvii). Besides, this interdisciplinary dialogue is

meant to pursue a more precise, and considerably more ambitious goal, namely putting "the evidence of science and of art to work in thinking about representation by offering third (or fourth, or fifth) ways beyond mimesis and convention" (xvi).

The extent to which this latter goal in fact provides the unifying theme of the book is very disputable. Only some of the essays directly address this supposed guiding topic. In fact, as acknowledged on the back cover, this volume "provides a set of interrelated problems" to engage with, "[r]ather than presenting a uniform program". One aspect of the dialogue, which contributes both to the richness of the book, and to the complexity of its structure, is that it is not interdisciplinary merely because it confronts scholars of the sciences with scholars of the arts. It is also interdisciplinary from a methodological and argumentative point of view. The majority of the contributions are by philosophers (of science, but also of language and of art). All but one of these philosophical essays draw from considerations about the arts to shed light on scientific representation; the exception is David Davies' paper, which proceeds in the opposite direction. The rest of the contributions are by specialists of art history and aesthetics. Most of them analyze different ways art and science can enter into a dialogue, rather than focusing on the topic of representation. This lack of unity and of balance, however, does not jeopardize the fruitfulness of the confrontation, which gives rise to analyses that are thought-provoking on many important — though somewhat unrelated — aspects.

The first three essays draw from considerations on artistic (both literary and visual) representation to clarify the epistemic value of scientific models. Catherine Z. Elgin and Anjan Chakravartty both resort to the Goodmanian toolbox. While Elgin relies on the notion of exemplification in order to understand how both literary fictions and scientific models "afford epistemic access" (9) to the properties they exemplify, Chakravartty tackles the question of approximate truth. He first distinguishes between two kinds of representational inaccuracy, namely abstraction and idealization. Drawing on analyses of works of twentieth century art, he argues that the conditions of approximation relevant to the concept of approximate truth are different in the two cases (abstraction and idealization). Approximate truth, he concludes, is "a virtue that is multiply realized" (49), relative to different conventions of representation. Nancy Cartwright draws an analogy between "highly idealized" models (such as the frictionless plan) and fables, or parables. The objects represented in models, like characters in fables, are "very unlike real objects in the real world"; they can nevertheless yield knowledge about that real world, through the mechanism of abstraction. Moreover, like parables (and unlike fables), models do not have their "moral" written into them.

Davies' remarkable essay draws from considerations on scientific thought experiments to shed light on the epistemic status of literary fiction. Appealing to what he labels the "moderate inflationary" account of thought experiments, a position he attributes to Mach, he defends literary cognitivism.

The three central essays of the volume explore the idea that scientific models can be thought of as fictions, along the lines of Kendall Walton's make-believe theory of fiction. Each of the three contributors elaborates this idea in different ways (sometimes explicitly criticizing the others). This constitutes a valuable extension to the

book edited by Mauricio Suárez in 2009 (*Fictions in Science. Philosophical Essays on Modeling and Idealization*). Whereas Roman Frigg distinguishes between two kinds of representational relationships (one between the equation, or any other form under which the model is presented, and the imaginary entity it stands for, the other between this imagined system and the target system), Adam Toon claims that there is only one representational relationship: models are props that prescribe us to imagine propositions about the actual entities of the real world. Manuel García-Carpintero brings the perspective of a philosopher of language into the discussion, and focuses on the problem of nonfictional statements about fictional entities, like "Zavalita is one of the most memorable fictional characters created by Vargas Llosa" (142). This helps to clarify the status of scientific propositions such as "the period of oscillation of the bob in the model is within 10% of the period of the bob in the system" (161).

Hunter's essay stands out from the other contributions by art scholars (below), since it is both a brilliant study of Hooke's material models and representational techniques, which he proposes to rethink by borrowing tools from analytic philosophy of science, and a useful contribution to the philosophy of science, which brings in new insights into the relation between modeling and experimentation. It is a valuable complement to the extant studies of the history of visual practices, which mostly stem from the tradition of science and technology studies, rather than of analytic philosophy of science.

Through a presentation of his edited book, *Visual practices across the University*, James Elkins denounces a symmetrical superficiality of the supposedly cross-disciplinary discourses. Artists are content with highlighting the "aesthetic properties" of scientific images, and scientists write about art "as if art's main interest is its scientific content" (178). He suggests that one should think in terms of visual practices, and pay attention to the various ways in which non-art images are constructed, by seriously studying their content. Dawna Schuld studies a collaborative experience between the artists Robert Irwin and James Turrell, and experimental psychologists in Los Angeles in the late 1960's. She shows how this collaborative work "challenges central tenets of both disciplines from which it draws" (233). Like Elkins, John Hyman criticizes some of the extant attempts to establish a dialogue between art and science. He offers a sarcastic, pitiless criticism of Ramachandran's and Zeki's proposals in neuro-aesthetics, which consist in clarifying questions of aesthetics by means of neurobiological tools.

Although this rich and heterogeneous book clearly achieves the goal of showing the fruitfulness of an interdisciplinary approach to art and science, one is slightly confused when trying to draw a conclusion about its central topic, namely representation. One reason for this might be the very variety of representational forms, both in art and in science. Examples of art works are taken in domains as diverse as literary fiction and visual arts. But nowhere is the question tackled of whether "artistic representation" can be considered as a kind. And, although the first lines of the Introduction emphasize the diversity of representational forms in science, from "photographs and computer-generated images to diagrams, charts, and graphs" (xv), nowhere is this diversity confronted to the variety of representational forms and styles in the arts. I sus-

pect this might be a fruitful way to overcome the mimesis/convention impasse, and one that naturally comes from an attention to practice.

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ANTONI GOMILA. 2012. *Verbal Minds: Language and the Architecture of Cognition.* Londres: Elsevier.

Los estudios empíricos sobre el impacto del lenguaje en la cognición han resurgido con fuerza en la última década. La aparición de esta cantidad de evidencia conlleva la necesidad de replantearse cómo las diferentes teorías explicativas sobre la interfaz lenguaje/pensamiento pueden acomodarla. Ésta es la tarea que Antoni Gomila se propone llevar a cabo en *Verbal Minds*: 1) analizar las diferentes teorías sobre la relación entre lenguaje y pensamiento, 2) revisar la evidencia acumulada durante estos años y 3) concluir qué teoría acomoda mejor los hechos. Estamos, por tanto, ante una obra interesante tanto por su carácter interdisciplinar, como por representar un enorme desafío para aquellos que ponen en duda el impacto del lenguaje en la cognición humana.

   Verbal Minds se compone de ocho capítulos que podemos dividir en tres partes. La primera parte consta de una introducción al fenómeno de la relación lenguaje/ cognición (capitulo 1) y un recorrido por las distintas posiciones que se han venido manteniendo sobre esta relación (Capitulo 2 y 3). La visión comunicativa considera el lenguaje como un sistema de cómputo independiente dentro de una mente 'modularizada'. Esta visión supone el blanco principal de Gomila, que arremete contra su eje de flotación: los argumentos fodorianos a favor del lenguaje del pensamiento, basados en la sistematicidad del pensamiento y en la imposibilidad del aprendizaje de conceptos; los argumentos de Pinker contra el rol cognitivo del lenguaje; y la tesis de la modularidad masiva como arquitectura funcional de la mente. Gomila rechaza la visión modularista por varias razones, como por ejemplo, su visión simplista del desarrollo ontogenético individual. Más adelante me referiré a las razones esgrimidas por Gomila para rechazar los argumentos de Fodor y Pinker. Tras analizar la visión comunicativa, se presentan las cinco principales posiciones cognitivas del lenguaje: El relativismo lingüístico, el lenguaje como reestructurador, el "pensar para hablar" (*thinking for speaking)*, el lenguaje como inter-conector entre módulos y el lenguaje como andamiaje social (capitulo 3). Gomila rechaza el relativismo lingüístico y la tesis del interconector modular. Además, es especialmente crítico con la versión del andamiaje social desarrollada por Andy Clark. Sin embargo, piensa que el lenguaje como re-estructurador puede dar cuenta de los fenómenos explicados por la visión de "pensar para hablar " y algunos fenómenos del andamiaje social que considera importantes, como el "etiquetaje léxico" (*lexical labelling*).

   La segunda parte consta de cuatro capítulos que analizan la literatura científica sobre impacto del lenguaje en la cognición. Gomila agrupa dicha bibliografía en dos grandes bloques: "El lenguaje como lente" y el "Lenguaje como caja de herramientas".