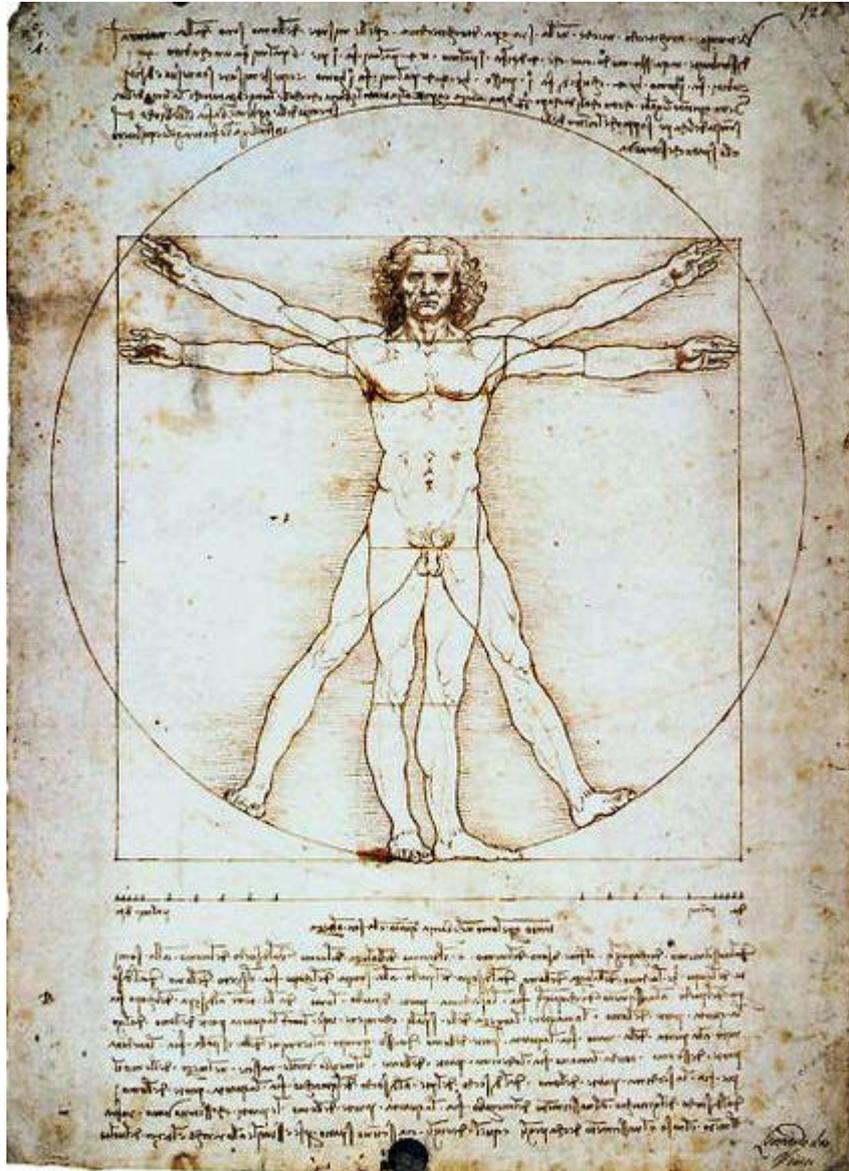


Beyond Mimesis and Nominalism: Representation in Art and Science



Two-day international conference in London, 22-23 June 2006



Beyond Mimesis and Nominalism: Representation in Art and Science, 22-23 June 2006

Introduction

Representations play a critical role in both science and art. Perceived as different in kind, artistic and scientific representations have been studied as objects of distinct disciplinary and intellectual traditions. However, recent work in both the philosophy of science and studies of the visual arts suggests that these apparently different representational traditions may be related in challenging and provocative ways. "Beyond Mimesis and Nominalism," a conference co-sponsored by the Courtauld Institute of Art Research Forum, the London School of Economics, and the Institute of Philosophy of the University of London, seeks to open conversations between and beyond these compartmentalized traditions of thinking about representation.

According to dominant accounts, scientific representation is explained by appeal to mimetic relationships such as similarity or formal relations like isomorphism. As these views have been subjected to increasing criticisms, recent approaches to scientific representation have begun to draw upon analogies with artistic representation. Significantly, parts of this emergent literature have turned to a "nominalist" position, not unlike that advocated by Nelson Goodman in his writings on representation in art.

But, a similar turn is already apparent within studies of visual art, where scientific representations are increasingly integrated into the analysis of art. Like their colleagues in the philosophy of science, recent scholars in the visual arts have seen Goodman's work as an important point of engagement. His pioneering work on the visual has informed recent efforts to expand semantic taxonomies and to analyze the increasing field of images that fall outside classification as "art." As this work has received important contribution from scholars concerned with scientific imaging, the project of rethinking representation is one of growing general importance to art-historical studies, whose interpretative scope has expanded dramatically outward in recent decades.

In order to develop this conversation, "Beyond Mimesis and Nominalism" brings together scholars from across the academy and all over the world. We welcome you to London and thank you for your contribution to this emergent discussion.

Beyond Mimesis and Nominalism: Representation in Art and Science, 22-23 June 2006

Conference organisers: Roman Frigg (LSE) and Matthew Hunter (Courtauld Institute of Art/University of Chicago)

Conference programme committee: Peter Ainsworth (LSE), Roman Frigg (LSE), Matthew Hunter (Courtauld Institute of Art/University of Chicago), Elisabeth Schellekens (King's College London), Christine Stevenson (Courtauld Institute of Art), and Sabine Wieber (Birkbeck College London)

Conference assistant: Andrew Goldfinch (LSE)

With thanks to the Courtauld Institute of Art Research Forum, the London e-Science Centre, and the Institute of Philosophy for financial support, LSE for providing the rooms and the audiovisual equipment, the Department of Philosophy at LSE for administrative support, and to everyone taking part and attending the conference.

Conference Program

June 22nd 2006

9:00 - 10:30: Registration and Introduction

Room G108, 20 Kingsway, LSE

10.30 – 11.00: Coffee break

Room G108, 20 Kingsway, LSE

11.00 - 12.30: Parallel Sessions

<u>Session 1: Architecture and Space</u> Room A316, Old Building, LSE Chair: Sabine Wieber	<u>Session 2: Representation and Similarity</u> Room AGWR, Old Building, LSE Chair: Pete Ainsworth
Abstraction and Planning: The Visuality of Urban Planning at Mid-Century in the United States Andrew M. Shanken, University of California, Berkeley	Models and make-believe Adam Toon, University of Cambridge
White Cube and Black Box: The return of the subject in 1960s American art and psychology Dawna Schuld, University of Chicago	Canny Resemblance Catharine Abell, University of Manchester
Representation and the aesthetics of architectural plans Sonit Bafna, Georgia Institute of Technology	Representation, Perception and Imagination Edward Winters, The Edward James Foundation

12.30 – 13.30 Lunch break

13.30 – 15.00: Parallel Sessions

<u>Session 3: Uses and Appropriations of Photography</u> A316, Old Building, LSE Chair: Nick Grindle	<u>Session 4: Truth and Objectivity</u> AGWR, Old Building, LSE Chair: Elisabeth Schellekens
Deception by Touch: The Nature Print and Photography in the Mid-Nineteenth Century Naomi Hume, Chapman University	Anti-realism and Aesthetic Cognition Ruben Berrios, Queen's University Belfast
Interoperability and the photograph Catherine De Lorenzo and Deborah van der Plaats, FBE University of NSW	Artistic Objectivity Christopher Eliot, Hofstra University
Scientific Aesthetics: The Methods and Photography of Eadweard Muybridge & Sol Lewitt Jeannine Tang	Varieties of Truth in Artistic and Scientific Representation Anjan Chakravarty, University of Toronto

15.00 – 15.30 Coffee break

Room G108, 20 Kingsway, LSE

15.30 –17.00: Parallel Sessions

<u>Session 5: “Mental Images”</u> A316, Old Building, LSE Chair: Matthew Hunter	<u>Session 6: Examples and Exemplification</u> AGWR, Old Building, LSE Chair: Adam Toon
Reasoned Images Josh Ellenbogen, University of Chicago	The Use of Examples as Symbolic Practice Elisabeth Birk, RWTH Aachen/Aachen University
Composite Images and Pure Dreams: The Communicative Functions of Iconic Signs Mats Bergman, University of Helsinki	The role of illustration in argumentation Gloria Origgi, CNRS, Institut Nicod
Learning through fictional representations in art and science David Davies, McGill University	The facts about pictures: A response to Perini Letitia Meynell, Dalhousie University

18.00 –19.30: Plenary Lecture

Kenneth Clark Lecture Theatre at the Courtauld Institute of Art

Report on the Book 'Visual Practices Across the University'

James Elkins, School of the Art Institute of Chicago/University College Cork, Ireland

June 23rd 2006

9.00 – 10.30: Plenary Lecture

Room G108, 20 Kingsway, LSE

John Hyman, University of Oxford

10.30 – 11.00: Coffee break

Room G108, 20 Kingsway, LSE

11.00 – 12.30: Parallel Sessions

<u>Session 7: Can Pictures Be Scientifically Explained?</u> A316, Old Building, LSE Chair: Josh Ellenbogen	<u>Session 8: Philosophical Accounts of Representation</u> AGWR, Old Building, LSE Chair: Otávio Bueno
Pictorial Depiction: Letting Neuroscience Say Something to Nelson Goodman Pradeep Ajit Dhillon, University of Illinois	The visual character of pictorial representation Katerina Bantinaki, University of Manchester
Chaos Damn It. Fractals and Jackson Pollock Francis Halsall, University College Cork	On the interpretation of Guernica: Why isomorphism won't do for representation – in art or in science Mauricio Suárez, Complutense University
Reconsidering Visual Experience and Pictorial Representation: An Enactive Approach Johan Veldeman, University of Antwerp	An Argument against the Conflation of Denotation and Representation Gabriele Contessa, London School of Economics and Political Science <i>Due to unforeseen circumstances, Gabriele Contessa will be unable to attend the conference.</i>

12.30 – 13.30 Lunch break

13.30 – 15.00: Parallel Sessions

<u>Session 9: Historical Encounters of Art and Science</u> AGWR, Old Building, LSE Chair: Christine Stevenson	<u>Session 10: Shaping the Mind - Imagining the World: Perception, Cognition and Representation in the Arts and Sciences</u> A316, Old Building, LSE
Circa 1600: a Scientific Watershed, a Nominalist Philosopher, and a Not-so-Realist Painter Itay Sapir, University of Amsterdam, and Ecole des hautes études en sciences sociales (EHESS), Paris.	Introduction and Session Chair: Dolores Iorizzo, London e-Science Centre, Imperial College London
Taming the Two-Eyed Beast: Doubtful Visions of Animals in the Seventeenth-Century French Academies Paula Lee, University of South Florida <i>Due to unforeseen circumstances, Paula Lee will be unable to attend the conference. Andrew Goldfinch will present this paper on her behalf.</i>	Visual Membranes: Optical Drawing Devices and the 'Subjective Objectivity' of Vision and Representation in Early Nineteenth Century Erna Fiorentini, Max Planck Institute for the History of Science
Between Art & Science: Representation, Dr. Richard Mead, & the Royal Society in the Eighteenth Century Craig A. Hanson, Calvin College	Vermeer and the Problem of Painting Inside a Camera Obscura Philip Steadman, University College London

15.00 – 15.30 Coffee break

Room G108, 20 Kingsway, LSE

15.30 –17.00: Parallel Sessions

<u>Session 11: Images and Knowledge</u> AGWR, Old Building, LSE Chair: Anjan Chakvavarty	<u>Session 12: ‘Shaping the Mind - Imagining the World: Perception, Cognition and Representation in the Arts and Sciences’ continued</u> A316, Old Building, LSE
Alchemy, Nominalism and the Art- Nature Debate in Medieval Literature Brendan O’Connell, Trinity College Dublin	The Very Visual Vocabulary of the Mind Anil Anthony Bharath, Imperial College London
Knowing with images: medium and message John Kulvicki, Dartmouth College	Sciences of the Face: Portraits and the Expression of Emotion, Character and Physiognomy Cynthia Freeland, University of Houston
Scientific Imaging: Representation, Mechanization and Interpretation Otávio Bueno, University of South Carolina	

18.00 –19.30: Plenary Lecture

Room S75, St Clements Building, LSE

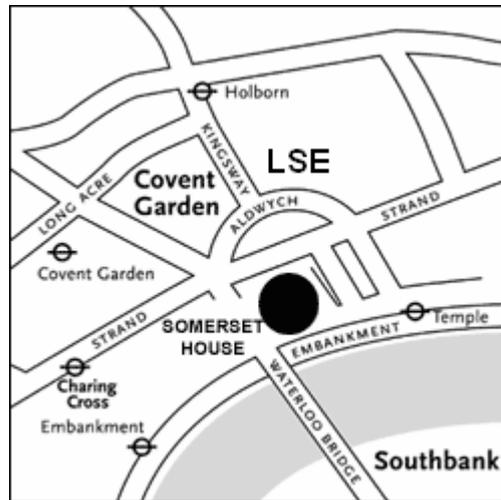
Exemplification, Idealization and Understanding

Catherine Elgin, Harvard University

Directions

All lectures will be held at LSE except the plenary lecture on Thursday 22nd June at 18.00 – 19.30 given by James Elkins. This lecture will be taking place in the Kenneth Clark Lecture Theatre at the Courtauld Institute of Art

The LSE and the Courtauld Institute of Art are in close proximity to each another.



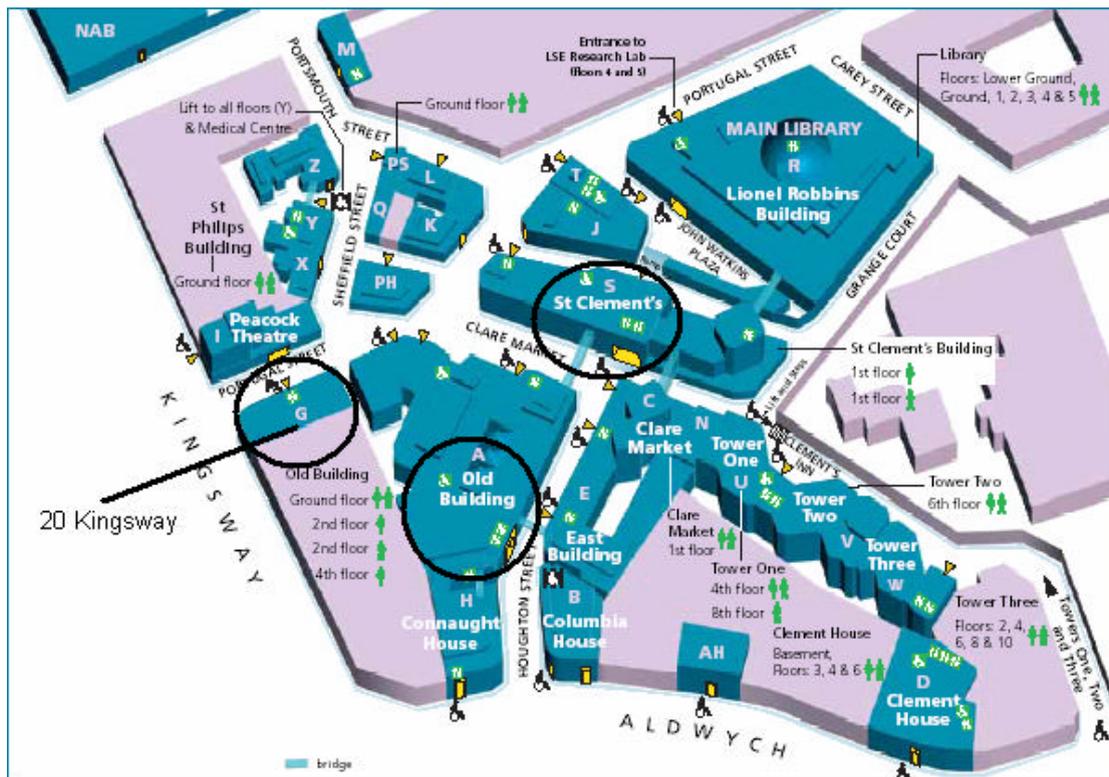
For events at LSE, four rooms will be used at various times during the conference: G108, A316, AGWR, and S75.

Room G108 is located in 20 Kingsway.

Rooms A316 and AGWR are located in the Old Building.

Room S75 is located in the St Clements Building.

All LSE buildings are located on the LSE campus.



Where can I find...?

- **A.T.M./CASHPOINT & BANK**
 - NATWEST. On campus, next to Old Building.
- **CONVENIENCE STORES AND NEWSAGENTS**
 - There are several convenience stores and newsagents on the Strand.
- **PHARMACY**
 - BOOTS and SUPERDRUG on the Strand
- **POST**
 - A post office is located on the Aldwych between the main LSE campus and Clement House.
- **FOOD**
 - Various restaurants and food outlets are located on the Strand and Kingsway.
- **UNDERGROUND**
 - The nearest underground stations are TEMPLE and HOLBORN.
- **INTERNET CAFES**
 - There is an easyinternetcafe located at the Trafalgar Square end of the Strand (456/459 Strand). It is approximately a 7-10 minute walk from the LSE campus. Its opening hours are 08:00-23:00, 7 days a week.
 - There is also an easyinternetcafe located at 358 Oxford Street (W1N 9AG), which is opposite Bond Street Underground station. Its opening hours are 08:00-22:00 (Sunday to Wednesday) and 08:00-00:00 (Thursday to Saturday).
- **EMERGENCY**
 - Dial 999.
- **CONTACT FOR NON-EMERGENCIES**
 - Matthew Hunter: *****
 - Roman Frigg: *****

What's on?: Exhibitions and other events to tempt your fancy

Victoria and Albert Museum (V & A): Modernism: Designing a New World 1914-1939

They say: "This major exhibition at the V&A is the first to explore Modernism in the designed world from a truly international perspective and in terms of all the arts."

****Note:** You will have to purchase ticket(s) for this event; although booking ahead is not absolutely necessary (at least from this reviewer's experience)

Opening Hours: 10.00 to 17.45 daily; 10.00 to 22.00 Wednesdays

Location and contact: Cromwell Road London SW7 2RL PHONE +44 (0)20 7942 2000

Transport: Five minutes from South Kensington Tube Station. South Kensington is on the Piccadilly, Circle and District Line, five minutes from Victoria, 10 minutes from the West End.

Tate Modern: Kandinsky: The Path to Abstraction 1908-1922

They say: "This exhibition follows Wassily Kandinsky's intriguing journey from landscape painter to modernist master, as he strove to develop a radically abstract language. We recommend booking in advance for this blockbuster exhibition."

****Note:** This exhibition opens on June 22nd and, thus, it may be difficult to get tickets.

Opening Hours: Sunday to Thursday, 10.00-18.00; Friday and Saturday, 10.00-22.00; Last admission into exhibitions 17.15 (Fri and Sat 21.15)

Location and Ticket office: Tate Modern is located on the south bank of the River Thames at Bankside, near Blackfriars Bridge, opposite St Paul's Cathedral and next to the Globe Theatre PHONE 020 7887 8888

Transport: By Underground: Southwark (Jubilee Line) and Blackfriars (District and Circle Lines) are the closest underground stations both of which are approximately ten minutes walk away.

Tate Britain: Constable: The Great Landscapes

They say: "This major exhibition offers the first opportunity to view John Constable's seminal six-foot exhibition canvases together. The 'six-footers' are among the best-known images in British art and were not even seen together in the artist's lifetime."

Opening Hours: Daily, 10.00-17.50; Exhibitions open 10.00-17.40 (last admission 17.00)

Location and Ticket office: Tate Britain Millbank London SW1P 4RG PHONE 020 7887 8888 - Menu number 1

Transport: By Underground: Pimlico (Victoria Line - 600 metres approx.), Vauxhall (Victoria lines - 850 metres approx.), Westminster (Jubilee and District and Circle Lines).

Smaller/Stranger/Further Afield:

Dinosaurs in Crystal Palace Park! Travel from London Bridge Station to Crystal Palace Station via National Rail (see <http://www.nationalrail.co.uk/>); the journey is about 25 minutes from London Bridge

Amazing Victorian Miscellany! The Horniman Museum includes a landscape garden; natural history exhibit; an award winning display of musical instruments; an aquarium; a truly impressive collection of African art and more. The museum is free and open daily 10.30am - 5.30pm. Travel from London Bridge Station to Forest Hill via National Rail (see above); the journey time is about 12 minutes from London Bridge.

Slightly Ghoulish (albeit spectacularly installed) Medical Rarities! The Hunterian Collection at the Royal College of Surgeons 35-43 Lincoln's Inn Fields London WC2A 3PE (5 minutes walk from the LSE) open Tuesday to Saturday from 10am to 5pm. Admission is free and the museum is open to all.

Abstracts of Presentations

Session 1: Architecture and Space

Abstraction and Planning: The Visuality of Urban Planning at Mid-Century in the United States

Andrew M. Shanken

This paper uses a Louis I. Kahn diagram of ca. 1944 as the point of departure for a critical study of the visual sources and strategies that architects and planners used in the 1930's and 1940's to communicate the obscure language of urban planning to the public. Kahn's diagram links the Vienna School philosopher Otto Neurath, New Deal literature, advertising, abstraction in art, and the social mission of the Modern Movement in architecture. The larger set of issues concerns the visuality of planning as a field positioned between art and science, and the ways planners harnessed graphic techniques as a means of creating authority for themselves. The promotional materials of urban planning thus help flesh out the shared visual culture of art and science in the context of bureaucracy, public relations, and consumer culture.

Kahn's engagement with diagrams illuminates a larger international phenomenon in which an array of graphic techniques drawn from other fields altered the representational basis of architecture and planning. In the 1930's, architects worked extensively with images that one is tempted to call *unarchitectural*: graphs, charts, and diagrams, materials that described neither the architectonic nor the spatial qualities of buildings. Naturally, charts and diagrams have played a role in architecture and planning throughout history. But their use intensified in the 1930's with the rise of the government as the largest client, the emergence of the social sciences and a society of experts, and the increasing complexity of bureaucracy in the period. Additionally, architects had to contend with the maturation of corporate culture and the advertising and public relations campaigns that went with it. In order to assert authority in this changing milieu, architects reached beyond the prevailing forms of architectural representation – plan, section, and elevation – for an abstract, popular, resolutely modern, and purportedly universal language in which to engage the public in thinking about planning.

The move towards an abstract, technical language drawn from charts and diagrams was part of a larger cultural move away from allegory and mimesis. In painting, Jackson Pollock, Adolph Gottlieb, and others were making their first forays into Abstract Expressionism. In architecture, the Modern Movement was supplanting the *École des Beaux-Arts*; and in planning, then still very much a nascent field, visual conventions were even more unsettled. Architects and planners in the 1940's experimented with visual strategies, from the biomorphism then current in late Surrealist art to Otto Neurath's Isotypes, organization charts, and the diagrams that illustrated New Deal literature.

A kind of diagrammatical imagination became a fixture in architecture and planning, laying the ground for the graphics of systems planners, and the more recent fascination with networks. All belong to a continuous, shared visual culture of organization and persuasion. The episode reflects the absorption into architecture and planning of what James Burnham called the "managerial revolution" in his 1941 book of the same title. Burnham wrote that society was increasingly ruled by managers wielding power in large bureaucracies, rather than by the speculative capitalists of the pre-1929 era. These managers were the personification of organization charts, their workers the bald icons plugged in or plucked out as necessary. In other words, the rise of a service economy brought with it new visual languages and literacy. And architects, who became increasingly entangled in corporate and government bureaucracies in the period, learned that language.

Abstraction bound the different disciplines together. Through abstraction, Meyer Schapiro triumphantly claimed in 1937, "The art of the whole world was now available on a single unhistorical and universal plane as a panorama of the formalizing energies of man." Abstraction, as a form of image-making with the nature of a "practical demonstration," yet bubbling over with the "formalizing energies of man," as Schapiro put it, offered a parallel to the presumed *tabula rasa* of urban planning that lies beneath many of the schemes in this period. Much like symbolic logic, these abstractions aimed at the universal at the same time that they reveled in the ahistorical, in the possibility of liberation from the drag of history – and from the obstacle of pre-existing buildings. A similar spirit emanates from Neurath's Isotype, which creates abstract figures as universal signs, with the ultimate goal of putting them to practical use. Armed with the incredibly rich and varied language of abstraction, architects and planners painted over Le Corbusier's brazen and far more literal plans to destroy the heart of Paris in *The City of To-Morrow and Its Planning*, which since its publication in 1924 had become one of the leading paradigms of urban planning.

Abstraction was thus seen as ameliorative, instrumental, and revelatory. Its claim to universality offered an ideal mode for planning, whose very nature remained, even at this late date, an abstraction, and which, in its most radical form, aimed to liberate the masses. Planning, the social abstraction that would rid the world of slums, create equality, reconstruct cities into ideal urban fabrics, and, as Kahn's diagram shows, extend the city's organization to region and nation, called on visual

abstraction as its mouthpiece, as its promoter. Through these associations abstraction drew planning closer to science and mathematics.

White Cube and Black Box: The return of the subject in 1960s American art and psychology

Dawna Schuld

This paper addresses the influence of developments arising in the field of psychology on American artistic practice in the 1960s and early 1970s, with important ramifications for how aesthetic experience is represented and understood. By the period in question, psychological behaviourism's emphasis on what can only be externally observed had relegated subjective experience to an inscrutable (epiphenomenal) "black box," but experimental and environmental psychology re-opened subjectivity to scientific scrutiny.

For a number of Southern California artists who began to experiment with creating art that relied heavily upon the methods and principles of experimental psychology, these developments had important implications. James Turrell, Robert Irwin, Douglas Wheeler, and Larry Bell experimented with the nature of perception, creating situations (rather than objects) that tested the legitimacy of human observation as reliable "truth." Often, this work was installed in enclosed rooms or pods, was disorienting and closely resembled experiments in sensory deprivation; in a famous case, Robert Irwin and James Turrell performed a number of sensory experiments in UCLA's anechoic chamber, a soundproof chamber that, with the lights off, almost completely deadened external stimuli, leaving the participant to perceive nothing more than her own perceptions (and, at times, hallucinations). It also incorporated simple illusions commonly used in perception experiments: James Turrell's early projection works are complex iterations of the famous "Necker Cube," a line drawing that demonstrates to subjects the oscillating nature of perceptual interpretation. Rather than relying upon observed behaviour as their data, these artists were interested in the nature of experience and were frequently subjects in their own experiments. In each of these situations, the viewer was encouraged (if not physically required) to take on a position of scepticism or, as Robert Irwin puts it, "rigorous wonder." The art became a laboratory of uncertainties.

For these artists, the development of a "phenomenal art" was an opportunity to explore the physical properties of aesthetic experience. By so doing, they were continuing a tradition begun by American pragmatists William James and John Dewey, who saw artistic meaning as embedded in viewer experience and who considered viewer experience in physiological (neurological) terms. Due in large part to the rejection of behaviourist anti-subjectivism, American pragmatism has in recent years been given renewed attention, particularly in the field of cognitive studies. In the 1960s, experimental psychologists such as Bruce Mangan and J.J. Gibson returned to James' vision as a means of incorporating experience into their studies (effectively rejecting the behaviourist approach), averting both behaviourism and the idiosyncrasies of psychoanalysis. Today, cognitive scientists who see consciousness in phenomenological (in contrast to epiphenomenal) terms include such notables as Bernard Baars (contrastive phenomenology), Francisco Varela (naturalized phenomenology) or Thomas Metzinger (self as process). The work of these scientists contributes to a deeper understanding of what exactly is being represented in installation art that takes perceptual experimentation as its medium.

I argue that the viewer's involvement in the situation (with or without an object per se) is the material, *contingent* core of the work of art, bringing into question the perceived neutrality of the high modern "white cube." At the same time, artists such as Irwin, Turrell, Wheeler and Bell expanded upon the work of experimental psychologists by bringing it into the gallery. Phenomenal art simultaneously challenges the opacity of the black box and neutrality of the white cube by making consciousness its medium.

Representation and the aesthetics of architectural plans

Sonit Bafna

I present a case study to explore how architectural plans function as representational devices. I start with a seemingly innocuous question regarding the status of architectural drawings, and end up identifying a much broader puzzle about the nature of representation in architecture in general. The outline of argument follows:

Are architectural plans representations? Nelson Goodman's answer in *Languages of Art* is no, since plans function as scores, i.e. as characters in a notational system with syntactic and semantic discreteness. In company with written specifications, plans function as scripts. However, in neither case do they exhibit the syntactic and semantic density that are necessary for a visual artifact to be identified as a representation.

This flies in the face of conventional usage. Architects routinely talk of plans as representations. This use of term may simply imply an undiscerning colloquial use, arising mainly from the fact that plans are projected entities, much as pictures are. A deeper, more systematic look at the use of plans would reveal what Goodman says—that plans are entirely conventional and are interpreted as inscriptions of discrete characters. This is true in so far as one is discussing the role of plans that function as working drawings, i.e. as specifications for executing built works, where it is necessary, often for legal reasons, to ensure that the construction is an acceptable instantiation of the drawings.

But there are other ways in which plans are encountered and used in architectural practice, and there the role of plans often transcends that of scores or scripts. This particularly the case when the interest in plans is specifically aesthetic.

I illustrate this issue through a description of a project by Ludwig Mies van der Rohe. The project is a design for a suburban villa—a *Landhaus*—and given that its design was developed for brick masonry construction, has come to be known simply as the Brick House. It is recognized as one of seminal modernist projects of the early twentieth century, although its planning was never developed beyond a schematic stage. In fact, all the critical acclaim given to the project comes from just two drawings that were presented at a Berlin exhibition in 1924—a plan and a perspectival view (see appendix). The original drawings themselves were lost after the exhibitions, but two small photographic prints have survived and these are the sources for a series of reproductions through which the project entered critical architectural discourse.

The first thing to note is that this project has enjoyed a wide critical acclaim despite never having been actually built or even developed completely. And this acclaim does not rest on promise, which one may find, for instance, in a not-yet-played musical score, but rather on actual aesthetic response evoked by the presentational drawings in their own right. A reading of the critical response to the drawings suggests that they function not just as digital diagrams, but as syntactically and semantically dense, even replete, artifacts.

Conventionally, one assumes that a plan is a proxy for (or denotes) a definite class of buildings (whether actually built, or potentially buildable). In the case of the Brick House, this assumption runs into a number of problems. First, the plan is very schematic; the walls are shown as thick, shaded lines, with no indications of their thicknesses, and the edge of floor is not specified clearly. This in itself is not a serious problem; it only implies that there is a very wide class of buildings, which are acceptable denotations of the plan but may differ from each other in the many substantive details left unspecified. More seriously, the plan and the perspective do not match—they do not refer, in other words, to the same class of buildings within the notational system specified. Again, it is possible to claim this situation only invalidates the particular reference, not the entire symbolic system. But it does challenge the assumption that a reference to a design or project necessarily implies a reference to a specific building, or class of buildings.

There is a further deep ambiguity built into the plan. One of the more dramatic, novel, and critically noted features of the plan is the sense of limitless extension suggested by three radially oriented walls that begin as interior walls, continue seamlessly through to the exterior as garden walls, and are abruptly cut by the edge of the drawing. This move further challenges the assumption that there exist definite buildings, whether built or not, denoted by the plan. After all, how long will the walls continue in any instance of the class of depicted buildings? Should it be exactly as measured in the plan, or should it go up to the boundaries of the site, however the site may be defined. The answer is not simple because the suggestion of potentially limitless extension of the walls is a critical point of interest in the plan. If these walls were to end abruptly, or arbitrarily, in a constructed building, then a significant quality would be lost. In Goodman's terms, by extending his walls to the edges of the drawing, Mies has turned the edge itself into a character within the overall symbolic scheme, but this character does not have a corresponding compliance within the realm of the actual built environment.

These drawings, then, do not pick-out a particular class of buildings as notational systems are designed to do, and they seem to exhibit qualities of representations. But this conclusion brings further complications regarding how they function aesthetically. Visual representations that are an object of aesthetic interest—as these drawings are—are typically so by virtue of their pictorial qualities. The aesthetic quality of these drawings, in contrast, does not lie in the way in which they depict their subject matter, as paintings would do, but rather is supposed to lie in the object depicted. Critical writing in architecture is seldom *about* these drawings; their role is ostensive—to point to the design presented. Thus under an aesthetic reading, these drawings are interpreted transparently as notations typically are, but unlike notations, they belong to as a dense, replete, and richly evocative symbolic scheme.

I suggest that this seeming paradox is created by the assumption that the physical building is the exclusive object of aesthetic interest in architecture, and the plans are merely a proxy for the building. However, drawings are involved in two different types of symbolic mappings. At a general level, the relationship between the drawing and building is best treated as notational, but under aesthetic readings drawings may also assume a role *parallel to* buildings as representational aesthetic objects in their own right.

Session 2: Representation and Similarity

Models and make-believe

Adam Toon

Often, in order to explain or predict the behaviour of a system, scientists must first model it. Modelling a system usually involves making assumptions that are false of that system. Planets are not perfect spheres, the nucleus is not a liquid drop and the molecules in a gas are not billiard balls. This

characteristic feature of scientific modelling poses a philosophical problem: how are we to understand what scientists write down when they model a system if what they write is false and is acknowledged to be so?

According to one prominent account, what scientists write down when they model a system are not claims about that system at all. They are definitions of an ‘abstract’ or ‘imagined’ object. It is this object that is the model. Perhaps the leading proponent of this ‘abstract object view’ of scientific models is Ronald Giere. But this conception of models is implicit in much philosophical writing on modelling and has a number of attractions. It can make sense of the false assumptions scientists make when they model a system: they are not claims about the system, but definitions of models. It can also make sense of subsequent statements scientists make once they have formulated their model, including those statements that seem to refer to non-actual entities like point masses or frictionless planes: these are simply claims about objects in models. However, the abstract object view of models also presents two significant problems. The first concerns its ontology: what are abstract objects and why should we think that they exist? The second is the problem of understanding how these objects represent the world. According to Giere, models are similar to the systems they represent. But similarity accounts of representation face serious difficulties.

I will propose an alternative account of what models are and how they represent. To do so, I shall draw upon Kendall Walton’s ‘make-believe’ theory of representation. I will argue that models are *fictions*, in Walton’s sense: like *War of the Worlds* or *Dracula*, the principal function of scientific models is to prescribe imaginings. Just as *War of the Worlds* asks us to imagine that London is invaded by Martians, so the billiard ball model of a gas asks us to imagine that the molecules of the gas collide like billiard balls. On this account, models are not abstract objects but are whatever is used to prescribe imaginings. This might be a set of equations, a diagram or even a three-dimensional physical model.

This account of models will not require us to grant the existence of ‘abstract’ or ‘imagined’ objects. And as a result, it will not saddle us with the task of understanding how such objects can represent the world. What scientists write down when they model a system are prescriptions to imagine that system in a certain way; there is no need to postulate any abstract object of which what they write is true. Moreover, I will show how we may understand scientists’ subsequent talk about models without construing it as talk about abstract objects. Walton’s analysis allows us to make sense of statements like ‘Dracula sucks blood’ without granting the existence of Count Dracula, even ‘as a character’ or ‘in fiction’. Similarly, I shall argue that we can understand scientists’ talk about models without granting the existence of point masses or frictionless planes, even as ‘abstract’ or ‘imaginary’ objects in models.

Canny Resemblance

Catharine Abell

I defend a novel version of the view that depiction depends on resemblance. Unlike rival resemblance accounts of depiction, the account I propose accommodates important features of both artistic and scientific pictures. Firstly, it explains why both intellectual and motor skills are required for the production of pictorial art. Secondly, it explains the important communicative role pictures play in scientific and other non-aesthetic contexts. While my account draws an analogy between depiction and language, it denies that depiction and language are analogous in respect of their conventionality, but argues instead that they are analogous in their dependence on non-conventional contextual factors.

A familiar problem with the most basic statement of the view that depiction is resemblance-governed is that every picture resembles a wide variety of things, most of which it does not depict. Resemblance therefore does not suffice for depiction. Plausible existent resemblance accounts hold that depiction depends on resemblance in a particular respect. Let us call this view the *Canonical Conception* of depiction as resemblance-governed (henceforth *CC*). Advocates of *CC* agree that the relevant resemblance is resemblance in respect of some shape property shared by a picture and its object: Christopher Peacocke terms the relevant shape property “visual field shape”; Robert Hopkins terms it “outline shape”; and John Hyman calls it “occlusion shape”. Although *CC* rules out many of the representationally irrelevant resemblances pictures bear to other objects, there are two reasons for which resemblance in this respect cannot suffice for depiction. Firstly, a picture may resemble a variety of different objects in this respect, although it depicts but one of them. Secondly, many pictures do not depict the object they most resemble in the relevant respect. For example, stick figure drawings depict ordinarily-shaped people, despite bearing a greater resemblance in outline shape to emaciated people with enormous heads.

To overcome this problem, advocates of *CC* generally appeal to intention. They argue that, although resemblance in the relevant respect, when taken alone, may provide an ambiguous or inaccurate specification of a picture’s object, the intentions of the picture’s maker determine exactly which object is depicted. A stick figure drawing depicts an ordinarily-shaped person rather than an emaciated person because that is what its maker intended it to represent. To ensure both that resemblance plays a significant role in such an account and that makers’ intentions determine a picture’s object only if those intentions are successfully realised in the picture, Hopkins holds that resemblance in respect of shape determines a picture’s possible objects, while intention serves merely

to select which of those objects is in fact depicted. Thus elaborated, CC thus yields a two-level account of pictorial content, according to which shape resemblance determines first-level content, while first-level content and makers' intentions together determine depictive content.

I propose a number of objections to this version of CC. Firstly, its emphasis on resemblance in respect of outline shape precludes it from accommodating the diversity of depictive styles. Secondly, by construing resemblance in outline shape and intention as the sole necessary conditions for depiction, CC provides an inaccurate view of the skills required for picture making. In particular, it emphasises artists' motor skills at the expense of the intellectual skills necessary for picture making.

The alternative resemblance account of depiction that I develop avoids both these problems. I argue that depiction is a matter of *intended resemblance*: while no single respect of resemblance is necessary for depiction, the diverse resemblances that govern different instances of depiction are united by the fact that the pictures' makers intended them to hold between the relevant pictures and their objects. Unlike CC, the account I propose is a single-level account of depictive content, according to which picture maker's intentions directly determine which respects of resemblance are representationally relevant. This account accommodates the diversity of depictive styles by enabling different pictures to exhibit different respects of resemblance to their objects. It explains why successful picturing requires both intellectual and motor skills because it requires artists to engage in successful communication with those who view their pictures. To do this, they must selectively exploit potential respects of resemblance between picture and object so as to produce a marked surface from which viewers are able to identify the relevant respects of resemblance and thus work out what the picture depicts.

The plausibility of this account depends on my capacity to explain our ability to identify picture makers' intentions from the marked surfaces they produce and thus to work out what their pictures depict. I argue that this ability is analogous to our ability to interpret sentences by appeal to contextual factors, without which those sentences would be left ambiguous. I develop an explanation of the former ability by drawing on explanations of the latter in the philosophy of language. The resultant account of depiction as essentially communicative helps to explain the wide variety of communicative purposes that pictures can serve.

I conclude by discussing a number of objections to my account. Firstly, one might object that, although picture makers sometimes intend to communicate with viewers, some pictures are not the product of communicative intentions. In particular, many artistic pictures seem to be made with non-communicative intentions. I argue that my view can explain this by distinguishing between those pictures that are the direct product of picture makers' communicative intentions and those that employ conventionalised depictive styles. While depictive styles fossilise or conventionalise the respects of resemblance that have been exploited in past pictorial communication, they need not fossilise the communicative intentions with which past pictures were made. It is thus possible for picture makers and viewers alike to exploit stylistic conventions in picture production and interpretation, obviating the need for communicative intentions. Finally, I consider further objections to my account posed by photography and by the cross-cultural interpretability of pictures and argue that my account is able to overcome such objections.

Representation, Perception and Imagination

Edward Winters

A good deal of recent work in the philosophy of science has concerned itself with the status of scientific pictures. Some of this work has addressed the literature on depiction recently pursued in aesthetics. Since the nature of depiction, whilst informing and informed by representational art, lies outwith aesthetics, it is reasonable to trace the congruencies and discords that are brought into focus when considering scientific pictures alongside artistic pictures.

I shall simply state a view of depiction, neutral between scientific pictures and artistic pictures, and then go on to investigate the merits and problems that my view of depiction celebrates and suffers, respectively.

The paper will look at images and pictures that have been deemed to be engaged epistemologically; and at pictures that play an explanatory role in our understanding of various phenomena. We look at various kinds of picture and assess their logical status. We then turn to fine art pictures to see in what way, if any, there are continuities with the epistemic character of science pictures.

Session 3: Uses and Appropriations of Photography

Deception by Touch: The Nature Print and Photography in the Mid-Nineteenth Century

Naomi Hume

In 1853, when the Imperial printing office in Vienna published a guide to their “polygraphic apparatus,” or the different printing methods they used to reproduce both images and texts, they opened the guide with a frontispiece that makes explicit this comparison between *Naturselbstdruck* and photography. The frontispiece presents a graphic schema of all the branches of the art of printing. At the top and center of this image, two muses float horizontally, facing each other, and shaking hands. They are labeled *Photographie* and *Naturselbstdruck*, respectively. Below photography are ranged the printing methods associated with art and industry. On the side below *Naturselbstdruck*, are those methods associated with languages and science. This small book presents a series of descriptions of various printing processes, but it is clear that the main aim of the book is to promote the Imperial printing office’s own new invention, what the author, Alois Auer, calls the “youngest daughter of the art of printing,” that is, *Naturselbstdruck*.

What did the Imperial printing office believe to be the relationship between photography and the *Naturselbstdruck* process, and of each to the arts and sciences? This paper investigates what these claims might mean for how representation was understood in the 1850s. By contrast to the claims made for the nature print, can we deduce what mid-century viewers understood photography to be? What do the projected applications for nature’s ‘self-printing’ process tell us about mid-nineteenth-century understandings of representation, truth, and the relationship between a depiction and an original object?

I will address the discourse of authenticity and representation through a close examination of the patent dispute that arose after the Austrians exhibited their new process at the 1851 Crystal Palace exhibition in London. The claims and counter-claims on both sides of the dispute provide a window onto this moment of projections and expectations about new and undefined inventions that offers the possibility to see what mid-century viewers hoped the nature print and photography would be and do.

When Auer showed off the results of his *Naturselbstdruck* process, he reported that

[t]hey found the resemblance so deceptive that they took them to be real lace, until, by touching and closely examining them, they convinced themselves that they were productions of the printing press.

The comparison of sight and touch in this case confirms the nature-print as a copy. At other times, however, Auer uses the tactility of the print to show how it can deceive viewers into believing it to be the original.

According to Auer, the Nature-print process involved placing a specimen between a sheet of lead and a sheet of steel and running them through a press at high enough pressure that the specimen would embed itself in the softer lead plate. Once the specimen was removed from the lead, the plate could be used for limited printing, or electrotyped to expand the print-run. The tactility of these images was achieved with the use of special inks that would reproduce the texture of the specimen's imprint.

Despite what seems, to the 21st-century mind, to be a complex, destructive, and messy process, Auer predicted a far greater application for his new process than he did for the photographic processes of Daguerre and Talbot. Part of his reasoning for this was that his process was compatible with contemporary text-printing processes, whereas the daguerreotype was a singular image on a metal plate, and talbottypes had to be printed individually on special papers.

Auer later printed plant-specimens with the process and their impressions, "like the lace," he claimed, "rivalled the original with regard to resemblance." Auer took this further, deliberately attempting to deceive his test audience, by printing impressions of both sides of an oak leaf on either side of a piece of paper:

Several such leaves were printed on both sides, and what with the colour varying in front and back, the skeleton closely fitting in, and such was the effect that connoisseurs, when holding them in their hands, and then looking at them through the glass, did not take them to be printed leaves, but natural ones, and they truly were surprised when I remarked to them smilingly, -- "Truly these are the impressions produced in an artificial manner."

Auer was very proud of the extent to which his printed specimens could deceive intelligent audiences. As much as these descriptions sound like nineteenth-century parlor games, however, Auer was quite serious when he pointed to the tactile qualities of his invention to claim that his nature print was more suitable for scientific representation than the photograph.

Interoperability and the photograph

Catherine De Lorenzo and Deborah van der Plaats

Web designers strive for systems that manifest 'interoperability', that is, an ability of two or more systems (or disciplines) to exchange information, and to use the information that has been exchanged. In this paper we want to employ this concept as a way of examining some nineteenth century photographic images and their multiple uses then and now.

In the geographic and ethnographic photo archives in Paris are images taken by commercial and 'artist' photographers working in Melbourne in the last quarter of the nineteenth century. One of the photographers is German-Australian J.W. Lindt (1845-1926), internationally known for his ethnographic images of Australian Indigenous peoples—especially Gumbayngirr, Bundjalung and Thungutti peoples of the Clarence River, Grafton — but in Australia also admired for his landscapes, often described by him as 'views' or 'scenery'. For the last thirty years of his life he had devoted himself to taking very specific images of the land: the cultivated landscape surrounding his home and business in the Yarra Ranges near Melbourne, and the subtropical wilderness of the larger setting. Lindt's images, and those of fellow photographers Caire and McDonald, could be admired for their descriptive records of the terrain; for the photographer's ability to convey a sense of being *in* the rainforest with its very distinctive *terroir*; or, upon occasion, for challenging prevailing notions of terror at the very thought of being lost in impenetrable bush. Through selected framing and choice of subject matter (e.g. graceful tree ferns) the images leant themselves to an aesthetic reading, and so fit happily above a title with the word 'scenery'. Yet, because of the excellent optics enabling detail to be recognised and examined within a larger whole— (a shrub could be botanically examined in a garden view) — and because their images appeared to so accurately replicate nature, these same images were sought after and mined by natural scientists and geographers. Not that the nineteenth century geographer was embarrassed by aesthetics—Humboldt's belief that careful observation could only be enhanced by aesthetics appears to have been widely understood and accepted—but nonetheless it was possible to strip the image of the sometimes sentimental title and to read it against current theories concerning botanical geography, place or origins. The assumed mimetic dependability of the photograph was obviously two edged: the images may have replicated nature but they were also 'seen' to exemplify or denote concepts valued by the viewer.

We will argue that 'interoperability' in the nineteenth century stemmed in part from the inherent multiplicity and affordability of the albumen print, and in part from its beguiling replicability of nature. We will demonstrate how artists, scientists and travellers alike valued one and the same image for largely different purposes. Today, however, with the exception of photo historians, use of the original images has declined. In place of a broad (multi-disciplinary) scientific interest in the nineteenth century images is a new set of contemporary ones focussed on reworking the subject matter (sub tropical sites in south east Australia): through diverse media the same sites have been used to address Indigenous dispossession and land rights, environmentalism, and spectacular tourism. Unintentionally, but

consistent with the idea of interoperability, current cultural uses of the subject matter provoke new readings of the old photographs—what was missing from the old? What, despite initial appearances, had been inserted?

An ever-increasing number of disciplines in the sciences and social sciences are paying close attention to their own distinctive uses of the image, often praising the ways in which they rigorously examine the image for hard evidence of physical and social qualities in contradistinction to the additional historical, contextual and aesthetic readings supplied by art historians. By examining uses of a coherent repertoire of images over time and across disciplines, the authors will show that scientists have no exclusive claim to a forensic reading, just as art historians have no exclusive claim to aesthetic value.

Scientific Aesthetics: The Methods and Photography of Eadweard Muybridge & Sol Lewitt
Jeannine Tang

The image, according to Nelson Goodman, is denotative, its meaning located within a semantic field of reference. Such denotation acknowledges the field that codes the possibility of such representation, vis a vis classification. The popularization of such thought arguably began in the nineteenth century with the institutionalized taxonomies of bodies and objects in medical and biological sciences, where the logic of deductive systematization was consecrated as methodology. A significant instance of this lies in the photographic documentation that functioned as empirical proof, as the medium's assumed verisimilitude and mechanical capacity for systematization legitimized such taxonomical claims, most famously in the motion studies of Eadweard Muybridge. Muybridge's work witnessed a revival in the 1960s-80s, where his body of scientific documentation took on greater aesthetic considerations, particularly in conceptual artist Sol Lewitt's visual quotation of Muybridge imagery. The significance of both these practices, within their respective contexts of nineteenth-century scientific method and twentieth-century conceptual art practice, holds manifold possibilities for the intersection of art and science at the threshold of representation and practice.

Muybridge's serial study of motion sequences in animals, humans and weather conditions were appropriated by Lewitt in his *Muybridge* works, where Lewitt created zoomed versions of Muybridge's images in peep-hole boxes, for viewers to experience the process of motion and perception as they traversed both art object and gallery space. Such systems of orchestrated viewer-perception raise issues of copies and reception, seriality and composition in artistic and scientific production, the corporeality of the body in scientific experiment and artistic orchestration, as well as the systematization and indexing of method, imagery and result through the allographic. These issues hinge on the necessity of a denotative field of reference Goodman establishes as the semantic key to interpreting the pictorial, which this paper elaborates upon within the terrain of the serial photographic tableau. This is particularly significant to both nineteenth-century scientific practice, as well as the discourses of conceptual art, which was heavily influenced by the writings of Thomas Kuhn, where meaning was established through the ratifying validation of scientific communities. Goodman's concepts will also be extended into, and re-evaluated through Pierre Bourdieu's symbolic fields of production, with an examination of the economic imperatives that underwrite such artistic and scientific taxonomies.

The implications of representational intricacies will thus be extended into conceptualism's quasi-scientific adoption of the previous century's scientific practice via a photographic impulse. Through a theoretical and specific study of both Muybridge's constructions of the motion studies, and Lewitt's conceptual art theories channeled through his reworking of Muybridge's photographs, I will demonstrate that the conflation of artistic and scientific practice changed the field of art production, through deliberate revisions of systems and methods.

Session 4: Truth and Objectivity

Anti-realism and Aesthetic Cognition
Ruben Berrios

At the core of the debate between scientific realism and anti-realism is the question of the relation between scientific theory and the world. The realist possesses a mimetic conception of the relation between theory and reality. For the realist, scientific theories represent reality. The anti-realist, in contrast, seeks to understand the relations between theory and world in non-mimetic terms. We will examine Cartwright's simulacrum account of explanation in order to illuminate the anti-realist position.

Science consists of phenomenological and theoretical laws. The former are concerned with appearances, or those phenomena that can be directly observed; the latter involve the unobservable reality that is alleged to underlie appearances, and are capable only of indirect confirmation. Phenomenological laws are said to be descriptive, whilst theoretical laws are understood as explanatory. Cartwright is concerned with the theoretical. She claims that the standard realist account of the explanatory efficacy of theoretical laws is faulty.

The explanatory power of theoretical laws consists in their ability to provide an explanation of physical phenomena. According to Cartwright, the realist claims that laws explain phenomena by

providing an abstract description of them, in terms of their micro-structural features, that is alleged to be true. On this view, explanatory power is entirely dependent on descriptive adequacy. As phenomenological laws describe appearances, so theoretical laws describe the fundamental reality that governs appearances. Cartwright rejects the preceding view and in its place proposes a simulacrum account of explanation. According to Cartwright, the explanatory power of theoretical laws is related not to descriptive adequacy, but rather to the construction of adequate models. To explain a phenomenon is to construct a model which best or most adequately accommodates the phenomenon to a theory. The model will consist of various posited objects that serve to explain the phenomena in terms that are consistent with a set of theoretical laws. Cartwright claims that theoretical laws are true of, or describe, the objects of the model. The objects of the model, however, are not descriptive of reality. They are simulacra. They have, that is, the form or appearance of things, without possessing their substance or proper qualities.

In light of the foregoing account we can summarise the distinction between scientific realism and anti-realism as follows. The realist claims that theoretical laws literally represent real objects. The anti-realist claims that laws represent objects of a model that are simulacra of reality.

Anti-realism has an aesthetic dimension. The movement from realism to anti-realism is also the movement from the mimetic conception of the scientist as holding a mirror to nature to the constructionist view of the scientist as engaging with nature through invention. There is a lot of the artist in the anti-realist's view of the scientist. This is true for Cartwright as well as, for example, Van Fraassen in his doctrine of constructive empiricism.

It would appear, then, that the philosophy of science has absorbed some concepts that are ordinarily housed in aesthetics. And it has done so profitably. The aim of this paper is to reverse the direction of disciplinary influence. Can art, in relation to its status as a cognitive enterprise, be illuminated by scientific anti-realism? I will argue that it can.

In an unexpected reference to the *Nicomachean Ethics*, Cartwright draws a suggestive parallel between theoretical laws and general moral principles, on the one hand, and physical phenomena and everyday moral conduct, on the other hand. If we add to this the claim that a central component of art's value is cognitive, then we have the basic materials with which to flesh out a broadly anti-realist view of art.

In the production of art, artists can construct models that mediate between everyday ethical phenomena and general ethical tendencies. These models reveal the ways in which there are implicit consistencies or inconsistencies, conflicts or congruences and so forth, between the phenomena and the tendencies. On this basis art can contribute to the reflective understanding of ethical life. This constitutes to a large degree art's status as a cognitive enterprise. To apprehend art cognitively as artist or critic is to engage in aesthetic cognition.

The paper will seek, in conclusion, to illuminate the role that the notions of representation and simulacrum might play in the conception of the relation between art and the ethical life.

Artistic Objectivity

Christopher Eliot

It is a commonplace that scientific representations are objective, or aspire to objectivity, whereas artistic representations are not and do not. That is, science as much as possible presents nature as we should come to see it, while art presents individuals' ways of seeing, absent any implicit claim that we should share their perspectives. An opposing current in philosophy of science especially since the 1970s—though of course with significant antecedents—has argued that scientific and artistic representation are not distinct in this way—that science can no more achieve objectivity than can art. (An early version of this idea appears, interestingly, in work by a philosopher of both art and science, Nelson Goodman, in *Ways of Worldmaking*.) The critique of scientific objectivity mounted in the following two decades by sociologists of science further eroded, in many quarters, the sense that science could be objective, while postmodernists' treatment of all representations as comparable 'texts' made it a commonplace around the humanities that both science and art are each fully subjective accounts of nature.

Philosopher of science Helen Longino (1990, 2002) has offered a sophisticated middle way between these alternatives. Taking seriously the underdetermination of theories, the theory-ladenness of observation, and sociologists' analysis of the ways the process of inquiry can structure its product, Longino has remained committed nonetheless to the value of objectivity in scientific representation. Accordingly, she offers an account of scientific objectivity as a function of a representation's openness to "transformative criticism," including its interrogation by a heterogeneous community with diverse values and objectives. An intriguing consequence is that a representation's degree of objectivity comes to depend on values normally thought to be part of the context of science, rather than in any way constitutive of it. Yet, through this incorporation, Longino defends an analysis of objectivity more robust than those, say, treating objectivity as a matter of straightforward correspondence.

However, there have been in the philosophy of science literature relatively few examples produced of objectivity arising through the sort of transformative criticism Longino identifies. This is not to say that

they cannot be produced, only that there have not been. She herself (1990) presents a case study from endocrinology, and there is one reanalysis of this case. But it is difficult to trace in scientific literature the role of the various value assumptions being brought to bear on a representation (model, theory, etc.), and much of the important criticism never reaches publication.

Art criticism—and for my purposes here, specifically criticism about the quality of representation—offers intriguingly parallel cases meeting Longino’s criteria for transformative criticism. For many works, a great variety of critics, wearing their value-assumptions much more on their sleeves than scientists typically do, brings a wide range of assumptions to the analysis of a particular artwork. Analyzing the history of criticism of several artworks (one of which I would present in a talk), I argue first that some such bodies of criticism reach Longino’s criteria for objectivity, at least to a degree.

This argument does not entail that art *is* science, because art will normally not achieve the degrees of objectivity reached by some scientific representations. However, it also does not entail that representational art merely stands at a waypoint on the path to becoming science, either. Art, crucially, can represent what science cannot, what is beyond the domain of science in the human world, especially in narrative works like fiction, theater, and film. Its representations may be just as strong, and as important, as those of science.

But there is another important difference between art and science, in that as a consequence of transformative criticism, scientific representations evolve, while most artworks remain relatively fixed once produced. (Many kinds of artworks change or develop after being produced, and for some this is crucial to their meaning, but unlike theories, even those do so mostly by accident or by design.) A scientific theory develops over time, while a film is relatively fixed.

This difference produces my second major point: what an artwork represents can itself change and develop over the course of criticism. Using a case study, I describe how even as a physical object (in the case of works which are physical objects) or set of words, or images, or the like, an artwork may remain the same over time, criticism can transform what we understand the work as representing. In this sense, the representational relationship itself between an artwork and its subject should not be understood as fixed by intrinsic properties of the artwork itself, but as plastic. This is so because the process which supports the degree of objectivity of a representation can be a process of revision and development without a stable endpoint. Criticism changes what we understand works as representing, and in doing so transforms what it is that the works themselves represent.

We emerge, then, with an account of how to understand art as representing well and poorly, making art not fundamentally different from science in that it can achieve degrees of objectivity, but also with an understanding of the representational relationship and representations themselves as consequently dynamic.

Varieties of Truth in Artistic and Scientific Representation

Anjan Chakravartty

Recent studies have suggested provocative analogies between practices of representation in art, and in science. One concept that has remained largely outside the primary focus of much of this work, however, is that of *truth*. This is not surprising, for on the surface, there seem obvious reasons to think that as a subject, the “truth” of representations is an unlikely source of fruitful comparison between artistic and scientific representation. In the context of the sciences, there is no general consensus regarding the epistemic status of representations; realists and antirealists about scientific knowledge have different views concerning the sorts of information models contain about the world. In the context of art, to the extent that one may be happy to speak of ‘knowledge’ or ‘information’, the senses of these terms may appear to be rather different than those commonly associated with the sciences. I believe the underlying intuition at work here is that, to the extent that one may predicate it of representations, the aesthetician’s concept of truth differs from that of the philosopher of science. In the current paper I challenge this intuitive, but I suggest ultimately mistaken dichotomy between artistic and scientific representation. The key to dissolving the dichotomy is to appreciate the epistemic consequences of what several authors have recognized as two fundamental techniques of representation in the sciences: abstraction, and idealization. I argue that the senses of ‘truth’ properly associated with these techniques in the sciences are importantly different, and that an understanding of this difference is facilitated by important lessons learned by considering analogous techniques in art.

I begin with a general, realist commitment in the philosophy of science. Scientific realism is the view that our best scientific theories (however this is assessed) are approximately true, or at least closer to the truth than their predecessors. Even realists, however, must grant two rather puzzling features of scientific knowledge: many of our best theories and models appear to incorporate high degrees of abstraction and idealization. These terms are often used synonymously, but in a seminal paper McMullin (1985) credits the origin of an important distinction here to Galileo’s defence of the (then) new science of mechanics. Roughly, an abstract theory is one that results when only some of the potentially many relevant factors present in reality are taken into account. Here we ignore other

parameters, either intentionally or unwittingly, that are potentially relevant to the phenomena at issue. Consider, for example, the neglect of frictional resistance due to air in the model of a simple pendulum. An idealized theory is one that results when one or more factors is simplified, again either intentionally or unwittingly, in such a way as to represent its object in a way that it could not possibly be. Here we do not exclude parameters *per se*, but rather characterize parameters that *are* taken into account in such a way that our characterizations of them are false descriptions of their counterparts in the world. In the *Principia*, Newton assumes that the sun is at rest in his derivation of Kepler's laws of planetary motion. But that would require that the sun be infinitely massive, and Newton of course did not believe this to be the case. The sun experiences small amounts of motion due to the attractions of other bodies; the attribution of infinite mass is an idealization.

Now, given that techniques of abstraction and idealization are ubiquitous in the sciences, and that both constitute a sort of deviation from the truth, how is the realist to regard them as yielding correct descriptions of their subject matter? Several authors have considered this puzzle, but none (to my mind) entirely successfully. Cartwright (1983), for example, argues that abstraction is positively correlated with explanatory power, but negatively with truth; the more abstract a model, the more useful it is for explanatory purposes, but the less accurately it represents the phenomena it is intended to model. Conversely (and leaving aside the issue of explanation here), I argue that abstract theories and models may be consistently regarded as correctly representing certain classes of phenomena, even though they are commonly and effectively applied to other classes which they do not describe correctly. Abstractions incorporate accurate descriptions of properties and relations of the systems they do in fact model correctly; the reality of such properties and relations is not impugned by the fact that there are others that might also have been included. In practice, abstractions are often *used* as idealizations – that is, used in application to phenomena they do not properly describe – but this does not compromise their epistemic status in connection with phenomena they do describe correctly.

The interesting or more controversial case, I suggest, is idealization. Philosophers of science are relatively quiet on the precise epistemic status of idealized theories and models, and it is here I believe that philosophical accounts of representation in art furnish helpful analytical tools. Some artistic representation is conceived “realistically” (e.g. most obviously in the case of, but not restricted to, Realist art), and this may be understood as analogous to cases of scientific abstraction. Other forms of artistic representation, however, are conceived rather differently, and here I think nominalist approaches such as those inspired by Goodman (1976) are especially provocative. I argue that one of the important lessons afforded by these studies for understanding the connection between idealized representations and truth in the sciences concerns a shift in emphasis from description to reference. This shift, which I suggest is natural in various artistic contexts, has a striking parallel in scientific realist responses to sceptical challenges such as the pessimistic induction (a scepticism regarding theories based on the history of science), and may prove crucial to understanding the nature of realism in cases of idealization.

Session 5: “Mental Images”

Reasoned Images

Josh Ellenbogen

“This is unspeakable rot! A disgrace to an educated man. As if there ever could be an analogous situation to that of Galileo! Is the camera going to supply intelligence and genius? Does not this mark the degeneracy of France? This man is a Membre de l’institute. This is enough for me. I want to know no more of this charlatan.”

With these words, C.S. Peirce closed the books on his rather short career as English-language translator of Etienne-Jules Marey. Yet, what caused Peirce to become so upset with the famed French physiologist, a certain suggestion about photography that Peirce discerned within Marey's work, demands more sustained attention than the great philosopher was himself willing to give it. My talk picks up the strand that Peirce's angry pronouncement offers, using it as a way into some of the most theoretically fruitful questions that Marey's work poses. In particular, my talk will directly engage with how Marey's project of scientific imaging denudes mimesis of analytic importance, how it thereby problematizes some of the entrenched ways commentators set art and science off from one another, and how it makes difficult the traits that photography, when it functions as an agent of scientific knowledge, is often purported to manifest. In pursuing these points, my talk will attempt to establish what Peirce can mean when he suggests the visualization devices Marey builds have the ambition to stand in, or act as substitutes for, human “intelligence and genius.” As I shall suggest, owing to how Marey's work undercuts the established accounts of what it means to make a useful or adequate photograph, the medium's capacity to perform such a substitution becomes, within Marey's investigative project, its primary standard of usefulness and adequacy.

Marey's photographic endeavor, which he pursued from approximately 1881 until his death in 1904, centered on visualizing a whole range of events that had no existence in the human eye's experience, from the swiftest motions of human and animal bodies, to the energy use of living

organisms. As was the case for an array of photographic projects that were contemporary with that of Marey (the work of Albert Londe, Francis Galton, Jules Janssen, etc.), the images Marey made had no antecedent object in perception to which they could attempt to be faithful or even try to resemble. As discussion of Marey is increasingly aware, the visualizations he produced, ones that stand in a conventional relation to their otherwise invisible objects, cannot be treated as superior or unbiased versions of what we know by the senses, but as forms of data that have no existence apart from the registration situations he contrived. It is only as a result of the specialized measures Marey took, ones he explicitly refers to as “artifices,” that visualizations such as figure 1 come to be. Minus the strange clothing in which he clad his models (see figure 2), the conditions of absolute darkness in which they performed maneuvers, the specialized system of camera shutters Marey arranged, and the newest high-speed films, the data Marey produced are without existence. The artefactuality of these images, and the conventional code they deliberately insert between observers and investigated events, represent the only means by which the events in question can become objects of study. Marey therefore operates against the general understanding of what it means to make a scientifically useful photograph, which often insists that the photograph’s credibility and authority as a means of making images derives from its ability to produce images that will appear to be unmediated, “transparent,” or convention-less. In the absence of mediation and artefactual intervention, Marey would simply have nothing to examine.

Yet, if we recognize how de-stabilizing Marey’s project is to certain of the ways in which we talk about photography and scientific imaging, a set of daunting questions present themselves. Above all, what does it mean to make a valid, or useful, or significant photograph of an invisible event? Entering use without an antecedent to which they might strive to conform, what are the duties with which such images might be tasked? While we can say that the relation between a set of white lines on a black ground and the body’s use of energy is a conventional one (see figure 3), what makes for a good or scientifically meaningful convention for depicting the invisible? Although these questions can be approached in a number of ways, one capacity of the photographs Marey produced appears especially noteworthy. When Peirce became so irate with Marey, he did so as he read one of the many suggestions Marey made regarding the ability of the photographic apparatus, when used in the proper fashion, to stand in for a part of the scientist’s own mental activity. That is, to photograph an event, at least under the specialized conditions of Marey’s research, was to subject it to treatments that had previously been the prerogative of human intelligence and human genius. The registration device, owing to how Marey employed it in his experimental work, automatically discharged these duties by itself, and presented the visualized event as though it had already been the object of human mental work. In particular, Marey believed that a useful photograph of an event was one in which the highest form of scientific endeavor, the discovery of the laws and general propositions that describe the natural world, had implicitly been enacted on the pictured event. To visualize an occurrence properly, in Marey’s account, is to perform on it a part of the trajectory that leads to the discovery of the law at work within it. In the argument that caused Peirce to become so upset, for example, Marey noted “Mechanics is founded on the laws of motion, laws of spaces described, of velocities, and of acceleration.” He then states “The difficulties Galileo and Atwood surmounted to determine these laws will for the future be saved in all analogous cases for those who shall employ chronophotography for the purpose.” In Marey’s estimate, to make a successful visualization is to visit on the pictured event certain of the treatments that culminate in the discovery of law, and that have heretofore required the agency of a Galileo or an Atwood.

In order to account for how Marey believes his images can accomplish such feats, I turn to certain strands of French philosophy of science from the fin-de-siècle, above all the celebrated work of Pierre Duhem. Aside from the historicist warrant for discussing Marey via an intellectual apparatus contemporary with his work, this move justifies itself by the deep conceptual overlap between Marey and Duhem. In Duhem’s account, the pre-condition for a sound mode of proceeding in science is the creation of a special kind of imagery, one that sheds itself of sensory originals to which it might strive to be faithful, and that becomes useful and meaningful for this very reason. Although, for Duhem, such image-making takes place within the mind of the scientific investigator, I shall show that there are profound resonances between Duhem’s understanding of mental imagery and Marey’s understanding of his own photographs. It is the fact of this overlap that allows Marey to advance the strong claims he does on behalf of his images.

Composite Images and Pure Dreams: The Communicative Functions of Iconic Signs

Mats Bergman

The claim that there is a distinct and significant iconic ground for representation has been the subject of intense debates in philosophy and related disciplines. In the 1960s and 1970s, the validity and value of the concept was strongly challenged by a number of prominent philosophers and semioticians, and it became increasingly associated with more or less discredited mimetic accounts of art. Indeed, as a consequence of the efforts of such “iconoclasts” as Umberto Eco, Arthur Bierman, and Nelson Goodman, *iconicity* appeared to have been all but eliminated by more robust nominalistic and conventionalistic theories of representation.

However, recently there has been a noticeable rekindling of interest in iconicity. In part, this trend is connected to the growing research into the semiotic philosophy of Charles S. Peirce, and an improved understanding of the subtleness and complexity of his original conception of the iconic as a

central mode of representation on par with the indexical and the symbolic. At least, this return to the original sources has shown that the seemingly devastating nominalistic and conventionalistic criticisms of iconicity are not able to invalidate the Peircean notion of iconic representation. In fact, if Peirce ever was their target, they seem to have missed their mark by considering neither the peculiar roles assigned to various modes of representation in Peirce's semiotic point of view nor the crucial role of abstraction in iconisation. At the same time, developments in linguistics and cognitive science have suggested that iconicity is a significant factor in language use and human thought, and consequently new theories of iconic representation have been developed. Admittedly, these more empirical (and often evolutionary) approaches differ from Peirce's resolutely philosophical standpoint – to the extent that it is not always clear whether the iconicity of many contemporary debates is directly connected to Peirce's concept of icon or not. But be that as it may, these discussions have certainly put the problems of iconicity, including the Peircean variant, back in the spotlight.

In this paper, my primary aim is to discuss a certain overlooked aspects of Peirce's conception of iconic representation. Most examinations of iconicity in the Peircean context tend to focus on the icon as a sign that represents its object by means of likeness or analogy – or, to be more precise, on the icon as *image*, *diagram* or *metaphor*. This is certainly not incorrect, as the well-known triad of icon-index-symbol constitutes an attempt to capture the principal representational modes. However, this emphasis on representation may conceal the fact that the standing-for relation under scrutiny is in fact abstracted from the broader sign process, which may more comprehensively be characterised as one of *mediation*. In Peircean terms, the question of how the sign represents its object does not cover the full sign function, because it omits the *interpretant*, the interpretive effect that is a constitutive part of the sign (rather than just an accidental product of the dyadic representational relation).

This, in turn, suggests that the iconic function in representation (understood as a standing-for relation) is actually subordinated to the role of iconicity in mediation. More concretely, the question that should be raised is what special role – if any – iconic signs play in mediating or communicative sign processes. In this paper, I will not attempt to present a full answer to this intricate problem. Instead, I shall discuss two purportedly distinctive communicative features of icons, as they are presented by Peirce. In particular, I will explicate his notion that the mental icon may be viewed as a composite photograph of past experiences, and scrutinise his claim that the principal communicative function of an asserted icon is to evoke such mental icons that in fact are experiential generalisations. As such, they can be said to be the carriers of connotative meaning in communication. Furthermore, I will investigate Peirce's suggestive contention that iconicity is a prominent feature of both scientific reasoning and artistic contemplation. As a painting may appear *as* the object rather than as a representation or copy of a presumably real object, if we temporarily manage to put its indexical and symbolic aspects aside, so in the midst of the reasoning process a mathematical diagram may appear to be the very thing rather than an abstraction. According to Peirce, we are dealing with "pure dreams" in both cases. They are neither existents nor generals, but such reveries may still prove to be highly useful and efficient for certain purposes. In fact, it is possible that this "iconic illusion" is needed for creative scientific thought and meaningful communication as well as for aesthetic appreciation.

Learning through fictional representations in art and science

David Davies

A number of philosophers have suggested that there are interesting connections to be drawn between philosophical questions about thought experiments [TE's] and issues that arise in the philosophy of fiction. I examine whether there are indeed such parallels to be drawn concerning the ways in which we might learn about the actual world through engagement with representations which, at face value, make no pretension to accurately represent that world. Can we perhaps profit by bringing work on the 'epistemological problem' of scientific TE's to bear upon the epistemological problems that attend the cognitive pretensions of works of fiction?

I begin by noting two respects in which TE's and standard fictional narratives are indeed comparable. First, TE's possess those features most plausibly taken to be the distinguishing features of fictional narratives. Secondly, considerations most plausibly thought to enter into the understanding of fictional narratives also enter into the understanding of scientific TE's.

The epistemological problem posed by scientific TE's consists in the difficulty, at least on any standard empiricist view of science, of reconciling the following three claims:

C1/ TE's do not rely on or provide any new empirical data concerning the state of the world. This is taken to be true by definition.

C2/ TE's provide us with new information about the physical world.

C3/ TE's, while they involve reasoning, cannot be reduced without epistemic loss to inferences of any standard kind (deductive, inductive, or abductive).

A *deflationary response* denies that there is a genuine problem, because either C2 or C3 (or both) should be rejected. By contrast, an *inflationary response* accepts both C2 and C3, thereby taking TE's to have a distinctive epistemic value, and offers an explanation of how TE's can possess that value. We

can also distinguish extreme and moderate versions of each kind of response. An extreme deflationist will simply deny C2. A moderate deflationist retains C2 but rejects C3, denying that TE's have any distinctive kind of epistemic virtue. A moderate inflationist supplements C1 by arguing that prior empirical knowledge can be mobilised in a new way by TE's. Finally, an extreme inflationist argues that TE's involve non-empirical modes of acquiring knowledge.

Arguably, at least some prominent scientific TE's - for example, Galileo's 'tower' experiment - are best explained on a moderate inflationist approach. I focus on what I take to be the most promising such approach - a moderate inflationism that argues that TE's are epistemically singular, and cannot be reconstructed as deductive or inductive arguments without epistemic loss, because of the way in which they mobilise cognitive resources available prior to the formulation of the TE. Mach, the progenitor of this approach, argued that we have 'instinctive knowledge', derived from experience but never articulated and perhaps even incapable of being articulated or made explicit, and that this knowledge is activated when we imagine ourselves in a hypothetical experimental situation. This explains how we are able to "immediately" draw the required conclusion on the basis of the TE narrative.

This kind of moderate inflationism has been most fully developed by philosophers who draw on work by cognitive scientists (e.g. Johnson-Laird) on the construction and manipulation of mental models in narrative comprehension. TE narratives, it is claimed, are used by the receiver to construct a quasi-spatial 'mental model' of the hypothetical situation. In running the TE, the receiver then operates directly upon the model, deriving the experimental conclusion by manipulating the latter rather than operating upon the linguistic representations comprised by the narrative used in constructing the model. In constructing and manipulating this model, we can mobilise various kinds of cognitive resources in ways not possible if we were to work directly on a regimented propositional account of the problem. Because of the role played, here, by tacit, unarticulated, and perhaps inarticulable, forms of knowledge, we cannot reconstruct a TE as an argument without epistemic loss.

Such an account of the epistemic virtues of TE's in science, if plausible, can be enlisted in defence of at least some of the cognitive claims of fictions. The standard objection against the latter is that the most we can get from reading fictional narratives are *hypotheses* about the general ordering of things in the world, or *beliefs* about specific aspects of the world, or *potentially insightful* ways of categorising things in our experience. Only if those hypotheses or beliefs pass further tests can they acquire the status of knowledge, it is claimed. The challenge is to provide some reason why we should accept the cognitive claims of literary works without further empirical test, or why our responses to such works are to be trusted. Standard defences of the cognitive claims of literature (e.g. Novitz and Young) either explicitly or implicitly decline to meet this challenge, and for some of these claims (e.g. the classificatory role played by fictional names as elucidated by Goodman) this seems to be the right answer.

It can be argued, however, that, as with some TE's, our responses to some fictional narratives mobilise unarticulated cognitive resources grounded in our experience of the world. The fictional narrative makes manifest what are presented as patterns underlying the complexity of actual experience. The rightness or wrongness of what is manifest in the narrative is 'tested' by our feeling that the novel has, or has not, revealed such patterns to us, and this feeling is to be trusted because it reflects the operation of such unarticulated cognitive resources in our reading. This can be cashed out in terms of the use of mental models in our comprehension of fictional narratives. The suggestion, then, is that the mental models through which readers comprehend fictional narratives also provide, through their mobilisation of tacit or unarticulated knowledge of the world, a means of testing some of those claims to knowledge of the actual world that theorists have located in fictional narratives, and thereby validate the idea that fiction can be a genuine source of knowledge of the world.

Session 6: Examples and Exemplification

The Use of Examples as Symbolic Practice

Elisabeth Birk

One of the most important problems for a study of visual practices is the choice of a description language that is general enough to allow for comparisons between different symbolic practices (such as the use of verbal and pictorial symbols) and specific enough to allow for meaningful descriptions of actual practices. I will argue that Goodman's theory of symbols provides some of the categories needed for such an analysis; this can be shown by applying them to a symbolic practice that is as complex as it is common: the giving of examples.

Examples have not been more than a minor object of study in rhetoric and epistemological traditions. In writings on rhetorical figures the almost exclusive attention bestowed on metaphor and metonymy has obscured other phenomena such as examples; very roughly speaking, the use of examples has been reduced to one apparently simple function – that of being a 'witness' (Aristotle) to

what has already been said and proven independently of these examples. It is only with Kant and the profound re-conception of epistemology he operates, that examples are, in a way, rehabilitated: examples are to empirical statement what schemas are to categories, they furnish the intuition that is indispensable to any knowledge as such. With Wittgenstein's language-games, finally, realistic and fictitious examples of linguistic habits have become the centre-piece of philosophical analysis.

These conflicting views are, in equal measure, present in our everyday conceptions about examples: it seems obvious that an example is an instance of a general concept, that we need it for purposes of illustration, that examples are mere data; it seems equally obvious that examples show what cannot be said, that there is somehow 'more' to them and that they defy description. In other words, an analysis of examples should help us to decide whether examples are indispensable or not and whether examples are innocent or not. Goodman's theory of symbols allows us to disentangle the two different strands of questions that make up these traditional approaches to the analysis of examples – the question, what distinguishes 'showing' from 'telling', from the question, what distinguishes an example from an image and intuition from iconicity.

According to Goodman, exemplification is a kind of reference: if denotation is the reference of a label (a picture, a predicate etc.) to its instances, exemplification is, conversely, "the reference of a sample to a feature of the sample", of what is denoted by a certain label to this label. If exemplification is defined by the direction of reference, it is obvious that being an example (as opposed to a denotation) and being an image (as opposed to, say, a verbal description) involve distinctions in different dimensions of description: iconicity does not depend on the direction of reference, but on how this reference operates; iconicity requires 'density' and 'repleteness' of representation, a wealth of aspects that "merge into one another". 'Showing' as opposed to 'telling' implies both: exemplification and density.

These distinctions direct a study of exemplificational practices to (at least) the following lines of inquiry:

- If not all examples 'show' something, some exemplificational systems will be digital. The conditions for such a use of examples will have to be described.
- Exemplification is selective, it involves choosing one of the many labels that apply to a given sample; this choice is largely context-dependent, and it is therefore essential to name the cue(s) that effect that choice.
- Being an example is, as Goodman points out, not the same thing as being a good example. A good example requires 'projectibility', i.e. it must be considered to be representative of a certain class of objects. Which samples are projectible depends largely on their acceptability in the wider framework of accepted practices; it will therefore be important to name the criteria of acceptability that make us perceive an example as a good example.
- 'Giving an example' is a symbolic practice that involves verbal, pictorial or other symbols or any combination of these. Many of these practices will therefore involve complex representational chains: If pictures are not used as examples in a discourse on pictures, but as examples in a discourse on what they denote, the label that is exemplified will be several steps further up in the chain.
- By retracing the steps in this chain, it is possible to locate what could be dubbed points of entry for 'mythological' connotations (Barthes), in other words, to show how examples can be exploited to convey more than just the one reference that is dominant in a certain context. A picture used as an example in a discourse on what it denotes will not only be subject to certain representational conventions, it might also contain clues that it should be understood as representing its object in a certain way – or conversely contain strategies to avoid such a 'representation-as'.

By exploring these aspects we can identify contexts where examples are indispensable and those where they are not as innocent as they seem. Such an analysis would involve an understanding of symbolic practices, visual and otherwise, not in isolation from each other but as interdependent practices in a cultural framework. Goodman's categories enable us to approach these practices without according a cognitive or ontological privilege to any of them; it takes us beyond the 'reading' of pictures as well as beyond the search for iconic or mimetic elements in texts. – Nominalism is a promising option for visual studies.

The role of illustration in argumentation

Gloria Origgi

Much of the recent debate about the role of representations in science and argumentation focuses on the role of visual representations in scientific reasoning. How do scientists use visual representations and what do these images mean? Can images be part of a scientific argument? And, if they can, how do they contribute to the overall meaning of a scientific argument? Visual representations are thus viewed as non-linguistic objects that can exploit the fine-grainedness of visual perception as opposed to verbal description for a variety of purposes such as conveying data, exemplifying an argument, or acting as cognitive facilitators in order to visualise information.

In this paper I will argue that illustrations, that is, cognitive facilitators that make things clearer to the mind, play a central role both in language and in other representational systems. In my view, illustrations (linguistic and pictorial) are a subset of exemplifications, and play a distinctive role in argumentation: Instead of providing evidence for an hypothesis (as exemplifications do in inductive reasoning) they facilitate the construction of a visual representation of that hypothesis. Both kinds of illustrations, linguistic and non-linguistic elicit semantically dense representations of a property or a concept presented in an argument. I will take some linguistic examples of illustration coming from the philosophical literature, in order to show that their role in the overall meaning of an argument is very similar to the role of images when used as illustrations.

Take the example of a relatively recent philosophical book, Margaret Gilbert's book on *Social Facts* (Routledge, 1989). She introduces the technical philosophical notion of "we-intentions" and the illustrates it with various examples, such as for example the "restaurant case" (p.175) in which: "A group of people are eating together, two of them, Tony and Celia, are engaged and the other two barely know each other. Tony asks Celia: "Shall we share a pastry?" Celia agrees. The one of the other man, Bernard, turns to Sylvia, who is sitting on his right and whom she hardly knows and asks "Shall we share a pastry?". She finds his use of "we" inappropriate". These stories are neither presented as pieces of evidence that may prove the hypothesis at stake, nor are they standard exemplifications (as defined in Goodman, 1976) because they don't possess the properties they are supposed to exemplify. They illustrate these properties by eliciting a visual representation.

Or take the more classical case of J.P. Sartre's famous illustrations of what "bad faith" means. He introduces the description of a scene, in which he pictures a girl sitting with a man who she knows very well would like to seduce her. But when he takes her hand, she tries to avoid the painful necessity of a decision to accept or reject him, by pretending not to notice, leaving her hand in his as if she were not aware of it. The second illustration of "bad faith" describes a cafe waiter who is doing his job just a little too keenly; he is obviously 'acting the part'. These descriptions play an obvious role in his argument by contributing to making the notion of "bad faith" more vivid.

These descriptive sketches require a narrative ability and may fail to elicit the appropriate visualisation of the concept because of lack of some aesthetic properties.

My idea is that illustration as a rhetoric device bears interesting relations with visual representations both in the case of linguistic illustrations and graphic illustrations. A better investigation of the notion of illustration could provide an insight on the role of visual representations in argumentation.

The facts about pictures: A response to Perini

Letitia Meynell

In "The Truth in Pictures" (2005), Laura Perini argues that any theory that can account for the epistemic efficacy of scientific images must start with a theory explaining how pictures can be true. She attempts to provide such an account, using Alfred Tarski's theory of truth (1958) and Nelson Goodman's theory of representation (1968). Three of Perini's central examples will be the focus of my critique. A graph and a chemical diagram are taken as exemplars of the type of Goodmanian symbol system that can be parsed and assessed. An electron micrograph, in contrast, is treated as a worrying but marginal case; though it speaks against her theory it is not taken as sufficiently significant to warrant its rejection.

I argue that Perini has inverted the significance of these images. Far from marginal, the electron micrograph is a type of representation that is paradigmatically pictorial. It has spatial properties that 'resemble' those of the represented objects—not accidentally, but crucially—and is thus fundamentally distinct from Perini's other examples, wherein the spatial properties of graph/diagram are arbitrary with respect to the object depicted. Indeed, I will show that Perini's graph (and arguably the diagram also) are not pictorial in any interesting sense. The analytic tools developed by John Willats (1997) and Kendall Walton (1990) provide both the groundwork for the critique and offer the promise of a more empirically grounded account of the function of pictures in science.

Goodman characterizes all representations, pictorial or otherwise, as symbol systems. Representation is understood as a subclass of denotation and, as any thing can be taken to stand for, or denote, any other, resemblance is taken to be irrelevant. Crucial to understanding the power of Goodman's theory is recognizing the motivations for it. Goodman argues that theories of representation that base representation of an object on resemblance to the object are hopelessly flawed and that his conventionalism is the only real alternative (Goodman 1968, Chapter 1). In short, copying an object "just as it is" (Goodman 1968, 6) is impossible, copying an object as it appears to be is also impossible (ibid. 11-12), so resemblance must be meaningless. What Goodman's remarks in fact justify is the recognition that there is no one right way to characterize resemblance relations between a representation and its object or the appearance of its object. Indeed, Willats' distinction, drawn from developmental psychology, between object centered and view centered descriptions highlight the fact

that with the creation of any representation comes a choice as to whether to represent the scene or our view of the scene. There is no *a priori* answer to this question. Indeed, Willats offers an extraordinarily rich analysis of drawing systems (including projection systems) and denotation systems (covering marks on the surface, the shape of these marks—picture primitives—and the “elementary units of shape information in a scene” (Willats 1997, 370)—scene primitives). Understanding these are crucial to properly understanding a picture, which following Wollheim, Willats conceives as “a two-dimensional representation of a three dimensional scene” (ibid., 369). At best, then Goodman shows that resemblance is complex, so a theory of representation characterized through resemblance is also likely to be complex. Willats offers some insight into this complexity. Because his account is focused on transferring a three dimensional scene onto a two dimensional surface, he is crucially concerned with spatial relations that constitute resemblance.

Though Perini explicitly adopts Goodman’s theory, paradoxically, she also allows that resemblance can play a role in representation. The decision as to which similarities are used is arbitrary—a mere convention. Thus the shape or colour of a drawn leaf can represent the shape or colour of the leaf itself through resemblance (in opposition to Goodman, this is taken to be meaningful); but acceptance of the resemblances as representationally relevant is merely convention. Against, this I follow Walton’s view that there is a special kind of representation, namely depiction, where, far from accidental, resemblances between object and picture are crucial. It is the particularly visual character of a depiction that distinguishes it from other representations, be they text or some other symbol system. The perceptual experience of depictions has a kind of dual nature (akin to Wittgenstein’s ‘seeing as’ and Wollheim’s ‘seeing in’). “It is this complex experience that is distinctive of and appropriate to the perception of pictures, the experience sometimes labeled ‘seeing the picture as [for example] a mill’ or ‘seeing the mill in the picture’” (Walton 1990, 295). Rather than grounding depiction on some kind of general appeal to similarity or illusion, Walton’s account depends on comparisons between the depiction and the object depicted. The relevant comparisons “hold between the process of inspecting pictures to ascertain what is [true in the picture] and the process of inspecting reality to ascertain what is true [in the world], between visual investigations of picture worlds and visual investigations of the real world” (ibid.). The processes of inspecting the object(s) in reality dictate which of the various modes and methods of depiction (Willats’ drawing systems and denoting systems) are appropriate.

We can see how Walton’s distinction between depiction and non-depictive representation nicely clears up a number of issues. The resemblances that inevitably support depictions are not cases of naïve copying, attacked by Goodman, but nor are they arbitrarily chosen as per Perini. Rather they are constrained choices whereby the crucial features that are of concern to the drawer and viewer dictate how the drawing is rendered so as to capture these features. A given representation *can* be purely conventional, but for a picture to be peculiarly pictorial depiction must be involved. Moreover, while Walton’s depictions will not necessarily be Willats’ pictures, they will tend to be. Walton recognizes that we *can* choose to use any thing to represent anything else (lines to represent housing developments, salt and pepper shakers to represent bicycle accidents); however, there are certain representations, depictions wherein there are crucial analogies between looking at the picture and the object pictured.

In the last part of the paper I will show that Perini’s graph is a non-depictive representation, while the electron micrograph is a depiction. A closer analysis of these images will also help to decipher whether the chemical diagram is depictive or not. While space constraints preclude giving an exhaustive account here, issues concerning the origins of the image, interchangeability of the content of the image with other content, and the relation of the image to text all play a part. This analysis will further explicate the distinction between depictions, which cannot be reduced to symbol systems because of their analogies with visual experience, and symbol systems, including graphs, which can be easily parsed using logical form because of their profoundly conventional nature. Ultimately, it will be concluded that Perini’s account, showing how the graph and chemical diagram can be both parsed and epistemically evaluated is fundamentally uninteresting because they are fundamentally not pictorial. Thus Perini’s central examples are irrelevant to the issue of pictorial representation in the sciences.

Session 7: Can Pictures Be Scientifically Explained?

Among other concerns, Immanuel Kant took aesthetics to be concerned with understanding how humans translate sensory information into representations thus blurring the line between different kinds of images. Further blurring the line between art and science, two neuroscientists, V.R. Ramachandran and Semir Zeki, have taken the lead in naturalizing aesthetics. In this paper, I wish to explore the usefulness of naturalizing aesthetics in helping advance philosophical aesthetics generally. Specifically, I intend to use neurobiological explanations of perceptual processing to help adjudicate between competing claims in the area of pictorial depiction particularly with regard to reference. In following this line of inquiry I will navigate between mimetic and symbolic theories of representation.

Gareth Evan's conception of reference and its connection to information-based thought provides a suitable model for Dominick Lopes for a perceptual account of how pictures refer. To understand pictures, he argues, viewers must employ a specifically pictorial mode of identification that singles out, based on their contents, the pictures' sources. Thus Lopes hopes to maintain Nelson Goodman's insight that pictures can fruitfully be modeled on other kinds of representation by taking them to be symbols of perceptual accounts of depiction while refusing to be bound by Goodman's nominalism. If pictures are symbols, they may be symbols whose reference depends on the exercise of perceptual skills.

In opposition to those who present consciousness as singular, unified and distinct from the micro-processes of our neural systems, Semir Zeki proposes a model in which the various, functionally specific, areas of the brain constitute regions of conscious activity with no higher interpretive cognitive processes. The impression we have of holistic experiences, he argues, is illusory. Some of Zeki's experiments have shown that we experience a lag between when we see color and when we perceive motion. Film makers use this phenomenon to great advantage. Introducing temporality and modular distribution to our understanding of visual perception, Zeki has added another dimension to our worries of depiction.

Let us consider Ramachandran's claim that artists either consciously or unconsciously deploy certain rules or principles to titillate the visual areas of the brain. Lopes would receive support from Ramachandran for demonstrating how important aspect recognition is for depiction. It is to uncover these forms that Ramachandran thinks that neuroscientists should pay attention to art forms across cultures. While Ramachandran does not draw on the rich philosophical discussion of depiction, we can see how this might parallel, if not outright support, Gombrich's use of the concept of substitution in depiction. Furthermore, Ramachandran recognizes the role of autobiographical and cultural memory in aesthetic perception. Ramachandran suggests that some trends in art history could be studied under the logic of peak shift such as the reliance of Picasso on earlier forms of African art. Furthermore, the principle of perceptually binding and grouping can often be found in art. Our ability to group and bind refines our thinking about pictorial depiction in a manner that takes us beyond debates of whether pictures are symbolic, substitutive, and perceptual explanations. Ramachandran also provides evidence from psychological studies and visual neuroscience for recognition and depiction such as Contrast Extraction, and Symmetry in laying out what he calls the eight laws of pictorial depiction and experience. Thus Ramachandran anticipates, and seeks to refute, the objection that originality and uniqueness are the main characteristics of art. Regardless of where we stand with regard to Ramachandran's eight bio-genetically based aesthetic universal principles, it is hard to disregard them entirely since they serve to refine philosophical questions.

In reading the neuro-scientific literature we learn, among other things, that there are many perceptual processes that result in visual experiences subject to cognitive contingencies; ambiguous images offer prime examples. Zeki argues that functionally specialized visual areas (such as those responsible for recognizing lines and angles, for example) draw upon other brain processes, such as memory and experience to produce a cognitive interpretation containing information that is actually missing, or misrepresented in the image. Hence, even though a depiction of a plate in two-dimensional space is given as an oval shape, in our everyday world dinner plates are usually round and so we experience the elliptical object as round. Zeki reminds us that our encounter with images does not merely produce one interpretation but is apt to vacillate between readings.

The philosopher Robert Hopkins presents six features of the experienced resemblance view of depiction. Two of these are especially interesting with regards Ramachandran's discussion of point of view in depiction, and Zeki's attempt to establish the neurophysiological bases of ambiguity. The first of these is Hopkins claim that "since resemblance can only be experienced to something with an outline shape, and since an outline shape and outline shape is relevant to a point, resemblance is experienced to something considered *from a certain point of view*." Drawing on experimental studies, Ramachandran argues that our neural systems strenuously resist singular points of view. Hopkins's argument motivated by a desire for certainty concludes by entirely rejecting Goodman who might have followed Zeki's naturalized account of pictorial ambiguity with considerable interest.

Lopes rightly, in my view, challenges Hopkins on all the features of his explanation of depiction in terms of experienced resemblance in outline shape (which he calls EROS for short). Specific to our discussion of Hopkins and Zeki in light of ambiguity he is accurate in pointing out that Hopkins theory relies on a point of view which should be loosely interpreted "for an object may be recognizable even when so rendered in two dimensions that the point of view is indeterminate or multiple, as in East Asian "roving eye" painting or analytic cubism."

Favoring recognition theory over Hopkins's EROS, Lopes remarks that "On EROS, central cases of depiction comprise only pictures that are experienced as matching their depicta in outline shape; all

others are marginal. By contrast, the recognition theory counts among central cases of depiction many pictures of nonstandard projection systems, cubist pictures, and otherwise stylized pictures.” Here Lopes is with Zeki on thinking about the possibilities of our experiencing plates depicted on as oval on a two-dimensional surface certainly as plates but also oval or round based on our perceptual relation to the depiction.

In this paper I seek to draw on neuroaesthetics to argue for a theory of representation that moves between mimesis and Goodmanian symbolic schemas. There might be some profit in looking to neuroscience when we raise questions regarding pictorial depiction even as neuroscientists have turned to art to develop their understanding of visual processing. Such interdisciplinary questioning should deepen our philosophical understanding of aesthetic representation, movements in art-history, refine the tools of art criticism, and perhaps even provide a framework for global aesthetics. Finally, while productive as this interdisciplinary inquiry might be we would not wish to reduce the aesthetic and scientific realms to each other. In the end, each discipline serves itself by crossing disciplinary boundaries.

Chaos Damn It. Fractals and Jackson Pollock.

Francis Halsall

The all-over abstract canvases which Jackson Pollock produced between 1943 and 1951 have proved notoriously difficult for art historians to deal with. This is undoubtedly a consequence of their abstraction. In the face of an apparent disintegration of the traditional pictorial distinction between figure and ground a multiplicity of readings present themselves. These may be based on either mimetic or nominalist readings. To many, including the baffled contemporary audience, they were nothing but an inchoate mess. In 1950, Time magazine referred to them as ‘Chaos’ prompting Pollock to wire a heated reply, ‘NO CHAOS DAMN IT.’

Given the suggestive ambiguity and ‘chaos’ of the images there is little in the work itself which challenges the numerous, often contradictory, readings that have been posited. In fact how art-historians approach such images tells us something about the way art history itself works. The plurality of questions raised concerning what the paintings actually represent is itself demonstrative of the wide variety of techniques which modern art-historians have at their disposal. Analyses have been based upon observations which are couched in the vocabularies of: politics (often Marxist); feminism; psychoanalysis, iconography; formalism and so-forth. At the time even the C.I.A. were in on the act, apparently realising that the ambiguity of the work left it open to political manipulation and secretly funding the promotion of Abstract Expressionism as a weapon of the cold-war. The distinguished art historian Ernst Gombrich voiced his celebrated frustration with abstract art in a manner that highlights the problems traditional art historical methods have with such art. Writing on Pollock’s *Number 12* (1952) he too seemed perplexed in the face of chaos. His response to the lack of explicit representational content or accountable meaning was to claim:

‘It is quite consistent that these [action] painters must counteract all semblance of familiar objects or even of patterns in space. But few of them appear to realise that they can drive into the desired identification only those who know how to apply the various traditional consistency tests and thereby discover the absence of any meaning except the highly ambiguous meaning of traces.’

Indeed if there is any consensus about Pollock’s work it is that a single, specific meaning will always allude us.

All of this makes the recent claims of three physicists to have found the ‘fundamental content’ of several of Pollock’s paintings as astonishing as the images themselves. In two papers which appeared in *Physics World* and *Nature* in 1999 Richard Taylor, Adam Micolich and David Jonas stated that through the application of ‘scientific objectivity’ they could determine the specific meaning of the paintings. In a follow up article which appeared in *Leonardo* in 2002 the claim was re-iterated with the bold statement that by identifying certain fractal patterns in the paintings the authors were: ‘ending 50 years of debate over the content of his paintings.’ To determine this ‘fundamental content’ Taylor, Micolich and Jonas had used methods employed by Chaos Theory and Complexity Theory and analysed several paintings. They found mathematical patterns in the apparent chaos of paint.

Their thesis implies that Pollock’s protestations of ‘NO CHAOS DAMN IT,’ can be verified by proving that there is an underlying structure to the images after all.

This paper explores the implications of such scientific methods of visual analysis. Relevant questions include (but are not limited to): how fractal patterns provide evidence of Pollock’s working method; how this may be used to date the work; how fractal patterns provide evidence of structure in Pollock’s work that are mimetic of naturally occurring forms; and that such structure explains the work’s aesthetic appeal.

My conclusion will present a response to such implications. I am skeptical of the art historical efficacy of such methods for two main reasons. Firstly because an effective account of any work of art must extend its focus beyond the singular work itself to the socio-political contexts of its production and reception. And secondly because, arguably, the power of Pollock's work, and hence his continued importance in the development of avant-garde art, is a very function of its abstraction. This means that attempts to find singular definitions of the representative content of the paintings (either mimetic or nominalist) will always be confounded by the works' complexity.

Reconsidering Visual Experience and Pictorial Representation: An Enactive Approach

Johan Veldeman

I shall propose to reconsider pictorial representation in the light of recent advances in our understanding of visual perception. It will be argued that the available models fail to properly account for pictorial representation. An alternative model of pictorial representation will be proposed, inspired by an enactive approach to visual experience.

The 'standard view' of depiction comprises quite diverging views that share the conviction that pictures need to be explained by invoking the unique type of experience they elicit. To sum up the most outstanding ones: 'resemblance theories' (Peacocke, Hopkins) hold that pictures represent because experiences of pictures are similar to experiences of their represented objects and scenes; on Wollheim's 'seeing-in theory', depiction is explained in terms of the distinctive phenomenology of simultaneous seeing the picture's surface and its represented objects; the 'illusion theory' defended by Gombrich explains pictorial realism in terms of an exact match between the content and the phenomenology of pictorial experience and the visual experience of whatever is depicted.

Although there is undeniably some truth in each of these theories, the attempt to explain pictorial representation in terms of pictorial experience is ill-founded. The common flaw with these proposals is that they are based on the assumption that one can specify pictorial experience in a determinate way, independently of what pictures represent. This is mistaken for several reasons. It overlooks that experience is 'transparent', so that its phenomenology cannot simply be captured by introspectively attending to it. Moreover, these approaches heavily draw on a conception of visual experience that treats vision itself as 'picture-like'. If one conceives perception as a process of building up a detailed representation of the world on the basis of the retinal image, as on the standard computational approach, then it might seem natural to see a picture as designed to produce a certain kind of sensory experience. Such a 'picture-like' conception of perception is problematic for several reasons, and it is being increasingly challenged by diverging alternative research programs that are united by their insistence on the importance of action and embodiment for the study of perception, and that suggest that seeing is essentially active and attentional. The implications of this paradigm shift for theories of art and pictorial representation have rarely been considered, however. One such implication is that any attempt to explain depiction in terms of pictorial experience is highly problematic. If visual experience is not some state that is produced in the brain at some stage in the visual processing, but if it rather active and dynamic, then any attempt to explain pictures by treating them as somehow equivalent to certain experiences is doomed to failure.

An independent and equally important reason for rejecting the standard approaches to depiction is that they are committed to taking some distinctive experience as a starting point, thereby severely violating the enormous diversity of pictorial representations. This has been very well acknowledged by Nelson Goodman. As a radical alternative, Goodman has developed a symbolic theory of depiction, which holds that visual art represents by way of a symbol system that has distinctive syntactic and semantic properties, just as a verbal language does. Goodman's groundbreaking theory has delivered some important insights that any theory of depiction should take into account. It explains pictorial diversity and it rightly points out that pictures belong to a system of representation and that correctly interpreting a picture requires knowledge of that system. Yet according to the symbolic approach pictorial systems are not constrained by perceptual mechanisms at all. As a consequence, Goodman is unable to explain what is distinctive of pictorial representation with regards to other systems of representation. Whereas standard theories are implausibly subjectivistic, Goodman's account is implausibly objectivistic.

A promising middle way is provided by so-called 'recognition theories', as defended by Flint Schier and Dominic Lopes. On this model, pictures are symbols whose reference depends on the exercise of perceptual skills: the ability to recognize the objects a picture represents is taken to be an extension of the dynamism of recognition generally. Recognition theory nicely reconciles symbolism with perceptualism. The principle virtue of recognition theory is that it rejects the deeply entrenched but mistaken assumption that pictorial representation is highly determinate and specific - an assumption shared by subjectivists and objectivists - and holds instead that it is essentially selective and aspectually structured. And since recognition abilities exploited in identifying what a picture represents are always dynamic relative to kinds of aspects, the account is able to explain pictorial diversity.

The central problem with recognition theory is with its appeal to nonconceptual representation underlying aspect-cognition, or so I shall argue. The approach draws on a modular view on visual perception, which is phenomenologically implausible. It will be argued that adapting the general insights of recognition theory to an 'enactive' approach to visual perception might yield a better explanation of the aspectual and selective nature of pictorial representation. On the enactive approach to visual perception, as developed in the 'Sensorimotor Contingency Theory' by O'Regan & Noë and in Alva Noë's *Action in Perception*, seeing is a particular skill-based activity of environmental exploration that is constituted by a kind of sensorimotor understanding, that is, the implicit understanding of the effects of movement on sensory stimulation. The enactive approach suggests a radically different conception of how pictorial representation might be grounded on perceptual processes, which does full justice to the phenomenology of experience and which does not appeal to representations in the head. It suggests that the perceptual skills that make it possible for viewers to grasp what pictures represent should be regarded as a kind of sensorimotor understanding. By explaining pictorial aspects, and thus the diversity of pictorial systems, in terms of aspects of the world of which we have a sensorimotor grasp, the enactive account reconciles the idea that pictorial representation is perceptually constrained with Goodman's central insight that depictions belong to pictorial systems.

Session 8: Philosophical Accounts of Representation

The Visual Character of Pictorial Representation

Katerina Bantinaki

The focus of my paper is on the claim, popular in pictorial theory, that pictorial understanding can be attained directly and entirely by means of one's visual engagement with a picture. I argue that this claim (which I call *the opticality claim* after R. Wollheim) is unqualifiedly true only in those cases that the viewer is suitably informed; I explain what the contexts are along which the viewer ought to be informed in order to understand a picture; and I point out that the opticality claim, as it ought to be understood, is not so much a claim about the process of pictorial understanding (as it is not unqualifiedly true of this process) but about the *character* of pictorial understanding: it indicates the fact that pictorial understanding, regardless of the way that it has been accomplished, is distinctively visual, to the extent that the upshot of an interpretation informs, and at the same time is informed by, what is *seen* in the picture.

On the interpretation of *Guernica*: Why isomorphism won't do for representation – in art or in science

Mauricio Suárez

In a scientific representation a model – more generally a representational *source* – stands in some putative relation to a system or object – more generally a *target*. What kind of relation is this – if it is indeed a relation? In previous work (Suárez, 1999, 2003) I presented five arguments against taking the relation to be similarity or isomorphism: the arguments from *variety*, *logical*, *misrepresentation*, *non-sufficiency* and *non-necessity*. The argument from variety points to the large number of distinct means of representation employed by scientists in their representational practice. The logical argument is inspired by (Goodman, 1971) and shows that isomorphism and similarity have the wrong logical properties for representation. The misrepresentation argument shows that isomorphism and similarity cannot make room for the ubiquitous phenomena of inaccuracy or mistargetting. The final two arguments (non-sufficiency and non-necessity) are supported by an analogy with artistic representation, and painting in particular.

The analogy helps to bring out the ways in which scientific representations can be said to be *representations* in the ordinary sense of the term. The force of the analogy between scientific models and painting is to a large extent a consequence of the currently dominating semantic conception of scientific theories. On this conception scientific theories are best understood as sets of models; and models in turn are best construed as mathematical structures. This is why I have illustrated some of my arguments and theses with analogies with three paintings: Diego Velázquez's portrait of *Pope Innocent X*, Picasso's *Guernica*, and one of Mondriaan's *Diagonal Compositions*.

The non-necessity argument in particular turns on the analogy with Picasso's *Guernica*. I argue that (1) if scientific representation is to be a form of representation in general, then it must be in line with artistic representation in the following sense: if isomorphism is not a necessary condition for artistic representation then it is neither necessary for scientific representation. I then defend the claim that (2) representational paintings are not representational in virtue of any isomorphism with what they represent, and I employ *Guernica* as an illustration. A simple *modus ponens* then yields the conclusion that (3) isomorphism is not necessary for scientific representation.

Steven French has contested my arguments (French, 2003), and in particular he has taken issue with the non-necessity argument. French seems to accept the analogy between scientific and artistic

representation while rejecting that isomorphism is irrelevant in both cases. In other words French apparently accepts premise (1) in my argument above but denies premise (2), and hence denies the conclusion. He first aims to defend, by appeal to Budd's work on the visual field (Budd, 1993), that artistic representation generally *requires* isomorphism. And then he attempts to show – more concretely – that *Guernica* is representational precisely in virtue of some kind of isomorphism – in this regard he appeals to the work of a distinguished American historian of art (Chipp, 1989).

I value French's reply for engaging with my argument in detail, and for taking what appears to be the hardest route to refute it. French's clever strategy is to turn my argument on its head in order to argue from the artistic case to the scientific case. It is clear that we agree that what goes in the artistic case goes in the scientific case. Hence our dispute concerning my non-necessity argument turns entirely on the thesis about art, and in particular on the interpretation of *Guernica*. I believe that French's argument is mistaken, and I stand firmly by my original theses. In this talk I would like to defend them publicly – both the general thesis regarding painting, and its more concrete application to the case of *Guernica*.

I defend the general thesis (when painting is representational this is not in virtue of any isomorphism) by criticizing French's interpretation of Budd's theory. First, I contest the theory by showing that arguments by Goodman (1971), Wollheim (1980, 1987), and Lopes (1996) against resemblance theories in general apply against it too. I then contest French's interpretation of *Guernica*, by showing that he glosses over key elements of the representational content of this famous painting. I review most of the historical scholarship on *Guernica* (including Arnheim, 1962; Blunt, 1969; Calvo Serraller, 1999; Cowling, 2002; as well as Chipp, 1989), and find that there is nothing in this literature to suggest that isomorphism plays a role in picking out its representational content – either as constituent of the representational relation, or as a means for drawing correct inferences from the painting concerning what it in fact represents.

An Argument against the Conflation of Denotation and Representation

Gabriele Contessa

In *Languages of Art*, Nelson Goodman notoriously claimed that 'denotation is the core of representation [...]' (Goodman 1976, p.5). Goodman has often been interpreted as claiming that representation is nothing but denotation. This interpretation of Goodman's claim may be questionable but in this paper, I will not discuss whether this is the correct interpretation. Rather, I will offer an argument to the effect that denotation and representation are two distinct relations. The argument goes as follows.

Suppose that we find an old portrait. If denotation and representation were identical, then, if we knew who is represented by the portrait, we would also know whom the portrait denotes, but this does not seem to be the case. By examining the old portrait, we can determine that it represents, say, an elegantly dressed 17th century gentleman, with a black goatee and dark brown eyes, but we cannot determine whom it denotes, as nothing in the portrait unmistakably reveals the identity of the sitter.

To this, an advocate of the identification of denotation and representation might object that it is not true that we do not know whom the portrait denotes. The portrait denotes whom it represents—it denotes an elegantly dressed 17th century gentleman, with a black goatee and dark brown eyes. The portrait denotes like definite descriptions do and not like names do.

The problem is that the inference from the fact that the portrait represents an elegantly dressed 17th century gentleman, with a black goatee and dark brown eyes to the fact that the portrait denotes an elegantly dressed 17th century gentleman, with a black goatee and dark brown eyes is unwarranted. For all we know, the portrait could be a mendacious representation of its subject (e.g. it could denote someone who actually had blue eyes and never wore a goatee), it could be an ironic representation of contemporary man whose manners resemble those of an elegant 17th century gentleman, or it could fail to denote any real person. Therefore, even if we know that the portrait represents a man with a goatee, it does not necessarily denote a man with a goatee.

It is crucial to note that the point of this argument is not that, unlike a very faithful portrait, a mendacious portrait denotes one person and represents another; nor does it mean that every portrait represents one person and denotes another (what John Hyman calls the external object and the internal object of the portrait). Rather, any portrait represents whom it denotes, but denoting them is not sufficient to representing them. The lack of substitutivity *salva veritate* between of co-referring expression 'the man denoted by the portrait' and 'the man represented by the portrait' in the above context is only due to the opacity of the intensional context (we know). The point is that 'represent' and 'denote' do not have the same meaning and do not pick out the same relation. Denotation, I conclude, may well be a necessary condition for representation, but it is not sufficient.

Session 9: Historical Encounters of Art and Science

Circa 1600: a Scientific Watershed, a Nominalist Philosopher, and a Not-so-Realist Painter

Along the fault line separating the tectonic plates of the Renaissance and what the French call *l'âge classique*, several intriguing phenomena are traditionally pointed out by attentive observers: first, an emerging “realism” in painting; second, a trend of scepticism in philosophy; and, last and probably even least, a temporary scientific vacuum, the unassuming prelude for the dramatic developments – a revolution, no less – of the years to come.

Today, the three contemporaneous processes are often described separately, if only because of disciplinary boundaries still very much alive. Alternatively, the new painterly taste for depicting reality “as it is” is annexed to a triumphant story of scientific glory – in spite of the temporal gap between the emergences of the two – whereas the philosophical episode is relegated to the status of an untimely curiosity.

In this paper, I will propose a revised account of this turn-of-the-century from a distant past, focusing on a new reading of the period’s greatest revolutionist in painting – Michelangelo da Caravaggio. I will ask to what extent Caravaggio should be called a *realist*; the question is particularly interesting in view of the link I suggest between Caravaggio and the philosopher who is convincingly described, by Antoine Compagnon and others, not only as a sceptic but also as a *nominalist* – Michel de Montaigne.

A new light is shed on the traditional philosophical opposition between Realism and Nominalism – as well as on the notion of *scientific* realism elaborated, among others, by Ian Hacking – when we consider both Caravaggio and Montaigne as presenting a parallel insight on the question of knowledge. I will claim that Caravaggio’s Tenebrism – simply put, his use of the colour black and of darkness to cover large parts of his paintings’ surfaces – is to be seen as a challenge to accepted notions of knowledge, visibility and their availability for the human eye and mind. As such, it is complementary and similar to Montaigne’s avoidance of systematic knowledge and even of the judgment about the possibility thereof. Thus, the philosopher’s nominalism is to be understood as coextensive with the painter’s subversion of mimesis as the latter concept had been perceived and thought of for two centuries at least. After all, the possibility of mimesis is based on a solid notion of knowledge: the entity to be imitated – or represented, as both translations have been suggested for “mimesis” – has to be, in the first place, available for knowledge. At the same time, Montaigne’s nominalism – i.e. his denial of reality for abstract entities – can be compared to Caravaggio’s depiction of specific figures with an often remarked presence effect: it is this “realism” of particulars that may hint at a nominalist approach to anything beyond the specific. Moreover, the resistance of Caravaggio’s works to attempts at deciphering, verbal translation and exhaustive account – a resistance underwriting Goodman’s distinction between the discrete units of language and the continuous nature of painting – echoes Montaigne’s pragmatic belief in the ultimate opacity of the world.

The historical position of Caravaggio and Montaigne, at the epilogue to the long, self-confident story of the Renaissance’s Humanistic culture, is pivotal in understanding their respective – and similar – projects. Michel Foucault describes, in *The Order of Things* (1966), the demise of the universe of correspondences and infinite layers that gave way to the emergence of a new *episteme*. Indeed, around 1600 the former system for the understanding and representation of the world was in ruins, whereas the new one was not yet fully developed. It is this experience of transition – a void waiting to be filled, and an ethos of a new beginning – that characterises the pictorial and philosophical innovations of the day; not surprisingly, this applies just as well to science and to scientific representation.

The “Scientific Revolution”, advancing from triumph to triumph all the way from Galileo to Newton, is not yet there; the mathematical representation of the universe’s totality has not yet taken the place once occupied by Humanism’s harmony of the spheres. The paintings of Caravaggio and the writings of Montaigne do not *represent* this state of affairs, however, precisely because the whole idea of representation – not to speak of a faithful-to-reality, informed representation – is questioned by their works.

I propose, therefore, to tell an alternative story about mimesis in Western culture, on the basis of the alternative model suggested by Caravaggio and Montaigne. This is a story parallel to the hypothetic scenario that Richard Rorty imagined in reaction to Stephen Toulmin’s *Cosmopolis* (1990): “showing how different the last three centuries would have been if Montaigne, rather than Descartes, had been taken as a starting point”. It also has significant ramifications concerning present-day epistemology for the humanities and the latter’s relation to science. One important paradigm to that effect is to be found in the agenda Rorty himself, in *Philosophy and the Mirror of Nature* (1979), attempted to promote. He distinguishes between *epistemology*, as a systematic, deductive rigorous idea of knowledge, and the more conversational notion of *hermeneutics*. And where knowledge production and representation are thus being challenged and revisited in one extensive field, the more general question of knowledge gains a new relevance, for the links between art, epistemology and sciences are complex and profound today just as they were in that distant mirror of 400 years ago.

This paper focuses on one aspect of “doubt” as an intellectual category: the inability to trust what one sees. Historical aspects of this question have been examined by a number of scholars, most notably by Martin Kemp and Barbara Stafford, whose studies have stressed the contributions of visualized forms of representation to the epistemological foundations of modernity. The argument presented in this paper is less concerned with the artistic doctrines or physiological studies used to theorize vision, though both will inevitably be engaged here. Instead, it is the insistent linking of sight to reason, which connects a physiological sense to cognitive capacity, which is questioned for its cultural implications. In other words, neither that coupling nor its exclusionary conditions are taken for granted. Instead, it is viewed as a historical construct directly informed by the emergent codes of the natural sciences, and examined as a philosophy as well as an aesthetic.

In this regard, the historical conditions inhabited by the seventeenth-century French courts are particularly illuminating. Not only did the reign of Louis XIV systematically exploit the authority of representation, ranging from dance to decoration, but a similar impulse informed the academic institutions that the Sun King inaugurated, setting the conventions which would be emulated for centuries. The academies confirmed the authority of the visual even in the literary tradition, where one would expect, *ut pictura poesis*, that poetry would trump painting. Rather than simply confirming an entrenched grammar of power, however, the terms of pictorial representation became the focus of heightened attention precisely because the eyes were no longer trustworthy sources of information. With one swipe of the anatomist’s knife, the Renaissance equivalence between the eye of God and human sight had been permanently severed, thereby introducing a ‘one eye, two eye’ problem that was not unlike the ‘one sex, two sex problem’ articulated by historian Thomas Laqueur. Insofar as the one-eyed gaze was imagined as purposeful and penetrating, the analogy is consistent. In both cases, a body was being observed that was either female or feminized, whose apparent attributes stubbornly contradicted an accepted version of the anatomy. And, given the choice between keeping the theory or dismissing the physical evidence, the theory prevailed precisely because it was sustained by a method. On its own, without textual support from the Ancients, the body was disorganized and deceptive, and not even the eyes of the interrogator could be trusted because they, too, were susceptible to corruption.

“God did not give us two eyes for nothing,” wrote engraver and dessinateur Grégoire Huret in 1670. But he was not stating the obvious: he had to vigorously defend that claim. It was not the anatomical reality of two separate eyes that was seriously questioned, but their role -- or possibly roles -- in the cognitive process of vision. Many organs in the human body are doubled, such as kidneys, lungs, breasts, ovaries, testes, and all of the digits and limbs. From a physiological standpoint, the partner is redundant. Was the second eye a spare, or did it contribute something specific? In 1679, architect and anatomist Claude Perrault presented before the assembled members of the Académie des Sciences the skull of a one-eyed infant, which had only one occipital orbit, and one canal for the optic nerve. It was unclear if the newborn was ever capable of sight, since it had died within minutes following birth. But the notes registered another detail: specifically, that what had been presented for the Academy’s inspection was not the skull, but a drawing. That Perrault’s skillful rendering was based on direct witnessing of the original was seconded by Duclos, who had gone with him to view the human “cyclops” and saw it firsthand as well. Whether the infant’s eye had ever functioned was impossible to determine, and ultimately beside the point. Instead, what was being certified by the assembly was the validity of the representation, as verified by a reputable witness who was also in the presence of the body and could vouch for its mimetic accuracy.

How reliable was this drawing as a descriptive document? Did Perrault use one eye or two eyes when he drew this tragic object? Though the question may seem peculiar, its ramifications were interrogated at length by Perrault’s frequent collaborator, Sébastien Le Clerc, who argued that the mechanics of vision demonstrated that that which was seen clearly was “only seen by one eye,” i.e. the active eye on the right. This eye corresponded to the vanishing point as the first element of linear perspective, a subject on which Le Clerc had written and illustrated several treatises. Winking off to one side, the left eye only “bothered” the right eye and offered “confusing” visual information. Thus, he explained, hunters closed the left eye to draw a bead on their prey, and painters ignored the information from the left eye, the better to raise their art to the ranks of a “mathematical science.” Unsurprisingly, Le Clerc asserted that the phenomenon of separate axes of sight for each eye was most evident in brutes and especially in birds. Because the eyes of birds were placed on the extreme sides of the head, Le Clerc explained, they could never see the same object with both eyes at the same time, and were obliged to turn their heads side to side. Because they were so far apart, neither eye could establish dominance, and the left eye was constantly offering irrelevant information. As a result, brutes were constantly confused, for they were literally unable to see reason.

Inside the Cartesian framework, the capacity for informed vision was only available to humans, as it was held that animals did not have reasoning souls and were thus unaware of what they were seeing. Notably, the converse was not true: the reasoning faculty did not derive from the possession of functioning eyes. Hence the mélange of creatures that Le Clerc showed in his illustration was crucial, for the engraving made it clear that the “confused” vision of animals was shared by some human. To wit, men limited by ignorance thoughtlessly used both eyes together. But to observe the world with two

eyes simultaneously -- “comme les yeux voyent” – was a simple physiological phenomenon, no different from any other creature’s ability to react to motion, produce sounds, and make gestures. Just as the howls of vivisected dogs and their juddering limbs were understood to be strictly mechanical actions that were unrelated to the awareness of pain, the ability to register light, color and motion did not reflect a reasoning mind in operation. In the 1630s, Jean François Nicéron’s experiments with the *camera obscura* (“dark room”) had shown this claim to be true: it was possible to project an image inside an actual room by puncturing one wall with a pinhole that would admit a thin ray of light. Per Descartes, the “painting” produced by natural light passing through the pupil of the eye, traversing the optical chamber, and hitting the retina followed exactly the same mechanical principles. Yet a man-made box had no more intelligence than a plank of wood, and no potential for sentience. In the same way, the eyes were empty chambers that were receptacles rather than agents.

“Reason” thus demanded that one eye be extracted from the cognitive equation, else wallow in brutish ignorance, victim to a diffuse and passive gaze incapable of intellectual penetration. As this paper will demonstrate, the resulting “one-eyed” drawings subsequently reflected the imposition of cultural will, crafting a way of seeing and a mode of representing that was self-consciously artificial, in order to distinguish the lineaments of science from the confusions of ordinary perception.

Between Art & Science: Representation, Dr. Richard Mead, & the Royal Society in the Eighteenth Century

Craig A. Hanson

In 1766 Dr. James Parsons published a notice, complete with an illustration, in the *Philosophical Transactions* about the double horns of an African rhinoceros. The rarity especially intrigued eighteenth-century virtuosi because it solved a dilemma that had pitted ancient authority against the discourse of early modern natural history. On the one hand, Martial made reference to a double-horned rhinoceros in the first century; and yet, in an age bent on empirical observation, the absence of double-horned specimens in Europe led many to question the reference (itself an interesting counterpoint to many of the unseen creatures that, nonetheless, continued to carry currency for many scholars). It was framed largely as a philological problem, and Samuel Bochart had attempted to solve the conflict by revising the translation. Dr. Richard Mead, physician to George II and a close acquaintance of Newton, had sided with Bochart, but as Parsons relates, once Mead saw for himself an example of the double horns, he invited Parsons over for breakfast and graciously acknowledged his mistake.

The instance raises a number of important issues related to the depiction of science including the role of ancient authority vs. empirical evidence, the contributions of travelers and traders who trafficked in such objects (along with more overtly economic goods including, at a moral nadir, slaves), and the social relations that facilitated knowledge production.

Mead is an especially interesting figure because of the way in which he himself bridged the worlds that we now think of as standing so far removed from each other, the arts and sciences. Mead largely embraced a classical conception of representation based on mimesis. He also belonged to an early modern context that has proven especially rich for historians of science who have embraced a fully socially constructed model that would stress the role of the gentleman scholar in the Royal Society, for instance, as a way to make sense of the content of scientific knowledge. In the context of the present conference, I want to use Mead and his contributions to the Royal Society’s proceedings as a way to think more closely about the function of representation in the early eighteenth century. I am especially interested in issues of practice and the status of images during the period. As it turns out, Mead, himself ended up with just such a double horn in his own collection along with a painting by Parsons himself of a rhinoceros. How do we relate pairs of objects like this? How do we fit this sort of picture in with Mead’s other paintings, which included works by the likes of Rubens, Van Dyck, and Watteau? The material is useful for engaging questions of the history of science, but given the importance of this period, it also holds the potential to inform larger discussions within the philosophy of science including suggesting what an art historical contribution might look like.

Session 10: Shaping the Mind - Imagining the World: Perception, Cognition and Representation in the Arts and Sciences

Visual Membranes: Optical Drawing Devices and the 'Subjective Objectivity' of Vision and Representation in Early Nineteenth Century

Erna Fiorentini

A 'membrane' is a thin, typically planar structure or material that separates two environments. Given that it sits between environments or phases and has a finite volume, it can be referred to as an interphase rather than an interface. As an interphase, a membrane selectively controls mass transport between these phases or environments.

One particular optical drawing device, the Camera Lucida, which was invented at the very beginning of the nineteenth century, seem to have been conceived and used in this sense, as a membrane suited to control the subjectivity of vision for the sake of objective representation.

Put between the eye of the observer, the physical world, and the image resulting from observation and drawing, the 'masses' this device transports are the visual stimuli from the outside world on the one hand and the perception data - as well as their subjective processing due to the physiology, the ratio and the emotional potential of the observer - on the other. The results find their way onto the drawing paper as visible, 'objective', recording of this process.

This peculiar connection of inside and outside, binding the subjectivity of the observer and the need to objectify it in representation without suppressing it, regulated the interrelation of vision and representation at the beginning of the nineteenth century. In fact, it not only corresponds to major theoretical shifts in the aesthetic and epistemology of observation and of its visual outcomes, but it can also be traced as a mass phenomenon, according to the success of the Camera Lucida in drawing practices with very different tasks in art and science (landscape sketching, archaeology, travel illustrations, natural history, and microscopy).

If the idea of ongoing interchange between claims of subjectivity and objectivity characterizes the basic principle and the use of optical drawing devices in the first three decades of the nineteenth century, then a division of motivations between such practices and concepts of representation driven by mimetic intentions and such based on nominalistic construction cannot entirely apply for this time. Nor does the idea of a sudden break occurring between regimes of vision and representation exclusively dominated by either 'objectivity' or 'subjectivity': The Camera Lucida as an optical metaphor and as an actual drawing device indicates - particularly in the comparison with another important optical drawing device of the time, the Camera Obscura - the historical prevalence of a mixed model of 'subjective objectivity' which I term Prismatic Vision, informing the interlacement of vision and representation at the beginning of the nineteenth century.

Vermeer and the Problem of Painting Inside a Camera Obscura

Philip Steadman

There is a general - though not universal - consensus among art historians that the 17th century Dutch master Johannes Vermeer employed the camera obscura in some way as an aid to painting. In 2001 I published a book *Vermeer's Camera* in which I presented an argument, based on a perspective analysis of the rooms appearing in Vermeer's interiors, suggesting strongly that the artist did indeed trace from the images projected in a large booth type camera. More controversially, David Hockney in his *Secret Knowledge* has proposed that many other artists from the 15th century onwards used optical images projected with concave mirrors. Much of the evidence adduced for these optical aids would seem to indicate however that painters did not just trace, but actually painted under or over projected images. How might it be possible to do this, given the relative darkness required inside a camera obscura? This paper will discuss the problem and report some experiments.

Session 11: Images and Knowledge

Alchemy, Nominalism and the Art-Nature Debate in Medieval Literature

Brendan O'Connell

In the *Physics*, Aristotle comments that the arts either, on the basis of Nature, carry things further than Nature can, or they imitate Nature. In doing so, he posited a distinction between the perfective and the mimetic arts that proved extremely durable. However, the Aristotelian idea of mimesis was not transmitted directly to the Middle Ages, but rather indirectly, through the popular and influential commentary on the *Poetics* by Averroes, which significantly modified the concept of mimesis to emphasise the moral function of poetry. JB Allen has noted that a fundamental concern of Averroes' *assimilatio* (the medieval version of *mimesis*) is to emphasise the ability of art to presume and generate a relationship between the particular and the universal. The rise of nominalism in late middle ages therefore presents a clear challenge to the nature and function of poetic art.

As William Newman has noted, the core distinction between the perfective and mimetic arts led many medieval thinkers and writers to employ analogies between art and alchemy when theorising about the nature and function of art. Indeed, Newman notes that alchemical manuscripts, in turn, frequently rely on analogies with art when defining the parameters of the alchemical project. The alchemical quest to create gold could be interpreted as the supreme and perfect achievement of mimetic representation, but it could equally be viewed as a near-demonic attempt to usurp the divine office of Creation. The metaphor is used brilliantly by Jean de Meun, in the *Roman de la Rose*, to explore the relationship

between Art and Nature. In particular, Jean de Meun draws parallels between alchemy and the visual arts, frequently emphasising the absolute inadequacy of the visual arts to imitate Nature.

This paper, however, will focus on the brilliant use of alchemy as an analogy for poetic representation in Dante and Chaucer. Both writers are keenly aware of the potential of drawing an analogy between alchemy and poetry; and both make superb use of the ambiguous status of alchemy in the fourteenth century, when it is by some respected as a true science, and by others denounced as the worst sort of fraud and trickery. Dante focuses on alchemical trickery and deceit in order to articulate a negative vision of poetry, against which he defines his own. However, it is with Chaucer that the metaphorical – and indeed philosophical – implications of the alchemical project are most fully realised. Towards the end of the *Canterbury Tales*, Chaucer teases out the philosophical implications of the analogical world-view that is implicit in the work of alchemy. In the apparent chaos of the alchemical world of the Canon's Yeoman's Tale, he shows a sharp observation of many of the key scientific and philosophical assumptions on which the claims of the alchemist are based. Importantly, he recognises that an insistence on the fundamental relationship between the universal and the particular, between species and individual, is key to the alchemist's hope of success, and he uses this to highlight (in a subtle but fascinating way) the challenges presented to analogical thought by nominalist and conceptualist philosophy. In doing so, he uses the alchemical analogy to explore and question the basic assumptions of medieval literary theory, specifically those found in Averroes' concept of *assimilatio*. Specifically, he parallels the alchemist's hopes for success with those of the poet, and suggests that the poet's attempts to present universal truths may be doomed to failure. Like Dante, he draws an analogy between alchemical fraud and the "fraud" of artistic representation; unlike Dante, this leads not to a celebration of the transcendent power of art, but rather to a rejection of the literary project itself.

This paper will take an interdisciplinary approach, and attempt to highlight the convergence of medieval philosophy, science and artistic theory in the medieval debate about the nature and function of literary representation.

Knowing with images: medium and message

John Kulvicki

There is something special about the way in which images, graphs, and the like present their contents to us. It is easy enough to say that in some sense our access to the information carried by such representations is rather direct or immediate, but rather difficult to unpack just what this special kind of directness or immediacy consists in. The fact that images seem so special is the source of the privileged place they hold as a means of presenting data as well as of the suspicion with which many regard them.

What are the epistemic advantages and disadvantages of using such representations? And along what dimensions relevant to these issues do different kinds of representation--images, graphs, descriptions, lists, etc.--relate to one another?

We claim that what makes images valuable is not just that they carry many very specific bits of information but the fact that they facilitate our getting at precisely the abstract bits of information we want. The way in which images encode such vast amounts of information allows viewers *readily* to abstract *a great number* of claims from that information. The information sought when viewing an image is often coarse-grained and qualitative, which is similar to what is sought when reading descriptions. The way in which images present fine-grained, quantitative information, however, makes much coarsegrained, qualitative info readily available. Such immediate availability of a great many pieces of abstract information accounts for some of the epistemological weight given to images and graphs, not to mention photographs. Descriptions, by contrast, are very selective in the pieces of abstract information that they provide. This means that there are limits on what one can do with descriptions that do not apply to images.

This paper explains what it means for a representation to make information *immediately* available, and then it explains the peculiar sense in which images make *many pieces* of information immediately available.

Presenting information immediately amounts to satisfying three conditions. First, a piece of information is immediately available in a representation only if it is *extractable* from that representation. Extractability just means just that there is a non-semantic feature of the representation in virtue of possessing which it carries the piece of information in question and *no other, more specific piece of information*. For example, red regions of the Doppler radar image indicate stormy weather of a certain intensity, nothing more. Being red says nothing about the location of such a disturbance: the relative *location* of the red region is responsible for that. Extractability concerns how *non-semantic* features of representations are responsible for the information that they carry.

Second, in order to present a piece of information immediately, the properties in virtue of which a representation carries that information must be perceptually salient: they need to stand out. We call this condition *syntactic salience*, because it says something about the non-semantic features of representations, not about their content.

Third, for pieces of information to be readily available, there must be a plan of correlation between features of the representation and features of the data that is easy to grasp. This is *semantic*

salience. Without semantic salience, interpreting a representation will be difficult, defeating its purpose.

Almost any representation makes some aspects of its content immediately available. What distinguishes images and related representations from descriptions and the like is that the former make information *across many levels of abstraction* immediately available.

Consider a 2D image of the temperature along that surface. The darker a region of the graph, the colder the corresponding region of the represented surface is. This image can carry all of the info that the list carries, and *no more information*, but it is much easier to abstract from the image's detail. With the image, abstractions over the data are extractable and syntactically salient (not to mention semantically salient). We show that for the list, these abstractions are not immediately available. For example, one could scour the list to figure out that region A is warmer than region B and that the difference between A and B is greater than the difference between B and C. It's easier to figure this out using the image because the region of the image corresponding to A is lighter than the region corresponding to B and the difference in lightness between A and B is greater than the difference between B and C. There is no need to decode the image or a part thereof in all of its specific detail before abstracting to these more general claims. Abstracting over features of the graph itself and *then* decoding it gets you to abstract features of the data.

It's easy enough to say that this results from there being an isomorphism between regions of the graph and their features and regions of the represented surface and their features, namely temperatures. Many agree that isomorphism, or the more general notion of homomorphism, marks off graphs and images from other kinds of representation. Without being inaccurate, this covering term often used to describe images and graphs misses what makes *this* kind of isomorphism so interesting, vis-à-vis the goals of those who need to use the representation. Isomorphisms are multifarious and ubiquitous, which means that they are in and of themselves unhelpful. The graph of temperature exhibits isomorphisms *across* many levels of abstraction from the determinate data points. Moreover, this particular isomorphism is syntactically and semantically salient. So, regardless of how abstract or specific one's information needs are, those bits of information are extractable from the graph of temperature along a surface in a syntactically and semantically salient manner.

After unpacking what makes images special, we go on to discuss how images thus described can be exploited for both elucidating and obscuring data.

Scientific Imaging: Representation, Mechanization and Interpretation

Otávio Bueno

Contemporary science, from experimental physics through chemistry to molecular biology, crucially relies on results obtained from scientific instrumentation, particularly a plethora of different microscopes (ranging from optical and electron microscopy to different types of probe microscopy). The images generated by these instruments shape, inform, and characterize substantial parts of the scientific enterprise. But these images can also mislead, be misinterpreted, and present as genuine certain features of the sample that may turn out to be just artifacts of the instrumentation. In the end, scientific images demand careful interpretation

In order to interpret scientific images, it's important to determine which kind of objects they are. In particular, are scientific images representations? It might be thought that they are. After all, certain features of the sample are selected for representation (say, in the case of a scanning tunneling microscope's image, information regarding the surface of the sample), whereas other features are left behind (such as details regarding the inner structure of the sample). However, there is also reason to think that scientific images are *not* representations. After all, such images are supposed to be the mechanical product of certain interactions between the sample and the microscope, and the more room that is left for intentional manipulation of the image, the less reliable the image will typically be taken to be. Again, in the case of a scanning tunneling microscope (STM), the image that is produced is the result of a particular sort of interaction between the STM's single-atom tip and the atomic configuration of the sample (see Binnig and Rohrer [1983], and Chen [1993]). Now, how should we make sense of this situation? Since we have reason to believe that scientific images are and are not representations, how should we proceed.

In this paper, I argue that as long as we distinguish the appropriate contexts in which scientific images are constructed and obtained, both answers regarding whether they should be taken as representations or not are ultimately correct. There are three stages to consider: First, when an instrument is being constructed and debugged, intentional elements play a central role, as the instrument is built in order to be sensitive to selected features of the sample. (I call this the *construction stage*.) Second, after the successful construction and calibration of an instrument, it is meant to provide a mechanical device of image generation, and at this point, we no longer have a representation. After all, at this stage, the intentional elements no longer play a role, and all the instrument does is to reproduce mechanically and enhance the relevant features from the sample. (I call this the *mechanization stage*.) Finally, after obtaining an image in a suitably calibrated instrument, it's still crucial to interpret the result, that is, to determine what the images means and what it establishes with respect to the sample. (I call this the *interpretation stage*.)

After distinguishing these three stages, it then becomes clear that there are representational components in scientific imaging in the construction phase and in the interpretation stage. In the construction phase, given that certain features of the instrument are selected, in fact built, in order to capture certain aspects of the sample, a particular representation has to be in place as part of the construction of the instrument. In the interpretation stage, in order to read the result of the instrument, one needs to adopt suitable coding conventions that specify what colors, texture, brightness etc. mean in the image that is generated. For example, to interpret an image from an STM, one needs to take it *as* an STM image and identify the relevant information that the image gives us about the sample. At this point, bringing results from the history and philosophy of art to bear on the interpretation of scientific images is both central and insightful, given how much these disciplines have made us aware of the multiple functions that coding conventions play in image making and in image interpretation. In turn, the mechanization stage should not involve any representational elements, since at that point the instrument should simply enhance and reproduce the features in the sample that it was devised to reproduce.

In this way, scientific imaging incorporates representational and non-representational components. I'll illustrate how this three-stage model of scientific imaging works, examining the case of scanning tunneling microscopy, from its early days in the 1980s to the many functions it plays in the current scene. I'll also explore the mechanism of representation that underlies STM imaging, and how suitable partial mappings from the sample to the images are crucial both in the construction and in the interpretation stages.

Session 12: 'Shaping the Mind - Imagining the World: Perception, Cognition and Representation in the Arts and Sciences' continued

The Very Visual Vocabulary of the Mind

Anil Anthony Bharath

In modern science, engineering and medicine, the still image and sequences of images play increasingly central roles, both in communicating ideas, and in the form of tools, almost as ubiquitous as the stethoscope and oscilloscope were less than a century ago.

Diagrammatic representations, and not just mathematical equations, have also held quite central roles in addressing the most fundamental of physical questions.

I develop a theme of tracing the links between communicating scientific ideas through representations, in the visual and mathematical sense. In particular, I will consider why visual representations continue to hold so much power and utility for even the driest and most apparently mathematical of scientific areas, by considering the biological evidence for the importance of visual information in cognition.

This biological perspective on how visual information is represented at early stages of visual processing in the human brain is, surprisingly, striking in its easy equivalences with verbal descriptions of visual structure, elegant in its mathematical detail, and stunning in its visual interpretation and significance. I will present these aspects through discussing, though in limited detail, some recent developments in the rapidly developing scientific field of "computational neuroscience", and will explore the significance and meaning of what is emerging as a neural code for visual data, formulated in terms of vocabularies of visual structure.

As proof of the power of what might appear to be quite prescriptive representations and vocabularies of visual structure, I will show how such representations are finding increasing use in areas of technology associated with the Internet, modern telecommunications, and of artificial intelligence, and will generally demonstrate how these very representations of visual structure are actively being transferred from linguistic, to mathematical, to visual, and to the machine domain. With the objective of creating a "seeing machine" this perspective will be presented as being very different from ideas on artificial intelligence popular in the 1960's, and will lend credence and further illumination to the ideas, pursued by van Fraassen and others, that the scientific discipline, and indeed our very perception of all things visual, is very much governed by our beliefs.

Sciences of the Face: Portraits and the Expression of Emotion, Character and Physiognomy

Cynthia Freeland

In this paper I sketch some key stages of development in the history of portraiture and conceptions of emotional expression. I will show there is a very complex relationship between artistic ideals in portraiture and philosophical and scientific theories about the nature and expression of human emotions. It will become clear that what is taken to be "truthful" in depictions of human beings and their fundamental natures has evolved alongside of scientific conceptions of the very nature of human emotions and the self.

I begin in the early modern period by discussing the relationship of Descartes' (1596-1650) treatise on Passions of the Soul (1649) upon the influential work by Charles le Brun, A Method to Learn to Design the Passions (1667). Le Brun's text became the guide for an entire generation of painters and encompassed the depiction of animal as well as human emotions. But le Brun did not simply adopt Descartes' views, he made important revisions, indicating that artists themselves contributed significantly to the conceptualizations of emerging psychological science.

I turn next to the enormously influential work on physiognomy by Johann Caspar Lavater (1741 - 1801). Essays on physiognomy: designed to promote the knowledge and the love of mankind. This work was known to philosophers such as Immanuel Kant and clearly influenced his early essay "On the Beautiful and Sublime." Translated into English in 1789, Lavater's work was made available in inexpensive and richly illustrated editions. Among others, it influenced portraiture of the most important painters of the new American statesmen and heroes by Gilbert Stuart and Rembrandt Peale in the United States.

The next influential scientist whom I discuss is Guillaume Duchenne de Boulogne, who published *Mécanismes de la physiognomie humaine* in 1862.

Working in the Salpêtrière, the same hospital where the painter Géricault had done a series of mental patients in 1822-3, Duchenne employed the new technique of Galvanism (electric shock) in experiments from 1852-6 to stimulate various facial muscles in order to demonstrate emotional conditions and disorders. Instead of drawings, he employed Adrien Tournachon, the brother of the eminent early French portrait photographer known as Nadar, as his photographer. This work was clearly influential upon Charles Darwin, who also used photographs to illustrate his important book *The Expression of the Emotions in Man and Animals* (1872). Darwin worked, among others, with the Swedish art photographer Oscar Rejlander, who actually posed for some of the images in the book.

To bring things up to the moment, I conclude by describing the work of the leading contemporary psychologist of the face, Paul Ekman, author of numerous books including *Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life* (2003). Ekman purports to be able to use his "facial action coding system" to be able to differentiate "true" from "false" (concealed or faked) emotions.

Interestingly, however, Ekman's studies employ video, and he often uses actors who "display" various emotions (much as Darwin's book did). I will compare some of Ekman's imagery to the large-scale, slow-motion imagery the recent major video exhibit *The Passions* (2003) by contemporary artist Bill Viola (b. 1951-).

My broadest aim is to show how art and science have interacted in these benchmark periods in the development of portraiture. Both art and science contributed to evolving ideals of the scope and meaning of facial expression in representational genres (from painting and drawing to photography and then video). Each stage both reflects and shapes broader cultural agreements about the very nature of human emotion and, in turn, what it is to be human.