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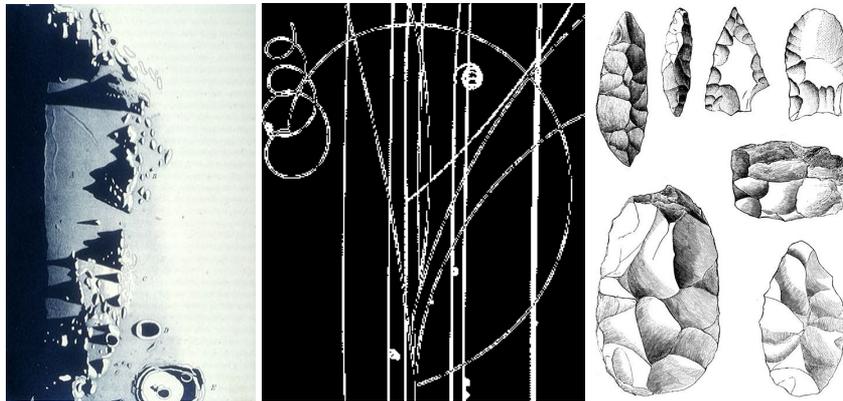
Centre National de la Recherche Scientifique



CALL FOR PARTICIPATION SUMMER SCHOOL 2006

# COGNITIVE BASES OF SCIENTIFIC IMAGES

## AN INTERDISCIPLINARY APPROACH



18-23 June 2006, Roscoff Biological Station, Brittany, France

### Eligible candidates:

CNRS Researchers, researchers, teachers, visual artists and doctoral students of French and foreign educational establishments, with an interest in the production and understanding of scientific images.

### Schedule of the school:

Mornings: Plenary sessions and discussions  
Afternoons: Workshops in small groups

### Invited lecturers:

Patrick Cavanagh (Harvard)

#### **The cognitive study of images**

Marc Fermigier (Paris)

#### **Images in fluid dynamics**

Julien Guy (Paris)

#### **Images in astrophysics**

Laura Perini (Virginia Tech)

#### **Pictorial Evidence: How do images provide support for hypotheses in science?**

John Kulvicki (Dartmouth)

#### **Issues in medical imagery**

**Convenors:** Anouk Barberousse CNRS-IHPST, Paris  
Roberto Casati, CNRS-Institut Nicod, Paris

**Scientific Committee:**

Nicolas Bulot, University of British Columbia , Laurent Pinon, ENS, Paris

**Organization:** Marta Spranzi, Université de Versailles, Marion Vorms, IHPST, Paris  
Gwladys Maure (CNRS Paris A)

**The topic:**

The theme of the school is the study of the cognitive underpinnings of the production and understanding of scientific images.

Scientific images (SIs) are subject to three powerful constraints.

They should be true to the facts

They should be understandable by a human subject

They should convey relevant and usable scientific information

Already on a *prima facie* reading, the constraints may be at odds. The norms of truth and of usability of scientific information may impose that the image contains elements that go beyond visual accessibility. For instance, a truthful representation of the distribution of individuals over a given area may clog the image and make it unreadable. The norm of accessibility may impose symmetric constraints. For instance, a legible image may require sacrificing some actual ingredients of a picture.

SIs may represent abstract entities or quantities as well as individuals. Charts, graphics, models, diagrams provide examples of the first type of SIs. In the second case, the individuals that get represented may be a star, a single particle, a whirlpool, a tool, blood flow in the brain, a geological stratum. Illustrations of the latter type have been much less studied than SIs of the former type, and are still poorly understood. The school will be centered on the study of the SIs that represent, even schematically, *individuals*. In particular, we shall investigate the following questions:

How much of the factual content of an image can be visually accessible without loosening the requirement of truth to the fact?

Are the strategies employed by visual artists to represent 3d objects still useful in scientific representations?

What are the advantages of line drawings of individuals over photographs?

What are the cognitive limits that define visual accessibility?

What can be represented visually in a picture?

Do dynamic (motion) pictures present specific problems?

How can theoretical content be represented in a picture?

What type of cognitive constraints are relevant for the production and the understanding of SIs?

What are the possibilities for visually schematizing an individual, and especially one that is invisible to the naked eye?

Is individual (token) tracking the function of a peculiar class of images?

What are the historical relations between artistic practice and scientific illustration?

Are there general requirements that apply to all SIs?

How can existing SIs be improved?

## The structure of the school and its expected outcome:

The school, conceived on the model of a “think tank” for advanced research, envisages certain consequences:

(1) As far as the subject-matter is concerned the project aims at establishing links between the disciplines within the scope of the theme (a cognitive approach to scientific images) and also seeks to construct a common vocabulary.

(2) As for the teaching format, this is a writing intensive school, as there will be two “written passages” by the participants.

(3) It is expected that during the school participants will formulate new hypotheses and define new perspectives of research.

This should lead to various middle-term results: producing scientific interdisciplinary literature; exchanging of knowledge at a high level to benefit not only researchers but also doctoral students; promoting interdisciplinary exchange and favoring the creation of new exchange networks, especially between physicists and biologists and researchers in philosophy and cognitive science; providing a favorable environment for small research networks in the field of cognitive science; producing pedagogically useful material for graduate scientific education..

### Teaching methods:

The organization of the school is indeed along the lines of an actual “school” and is not just a conference in disguise. The convenors have already organized a number of programs of this type at Pontignano (Siena, Italy), Paris (Jackendoff workshop, Institut Nicod), Oléron Summer School 2004 on Reference to Objects, Les Issambres Summer School in the Philosophy of Science 2005.

The articles recommended by the lecturers are made available to the participants one month in advance. Two “written passages” are then expected: (1) e-mails of individual readings are to be sent by the participants to the organizers two weeks before the school begins, (2) collective work in breakout groups leads to a daily short mid-term reports.

Our lecturers are leading authorities in their respective fields. Each day will be devoted to intensive interaction with one of them.

The school will go on from Monday to Friday. The following is a first presentation of the program (the order is subject to possible changes)

Program:

### Monday 19 June Patrick Cavanagh (Harvard)

#### The cognitive study of images

Patrick Cavanagh was born in Oakville, Ontario in 1947. He received a degree in Electrical Engineering from McGill University in 1968. An interest in artificial intelligence led to a Ph.D. in cognitive psychology from Carnegie-Mellon in 1972. He taught at the Université de Montréal in Psychology until 1989 and since then has been a professor of Psychology at Harvard. His interests include memory, vision, and attention. He studies image understanding and image processing in humans using techniques influenced by current research in physiology and computer science. Current projects study the roles of attention in selecting and creating visual representations, its role in high-level motion perception, the acuity of visual attention and the encoding of event timing in the parietal lobe of normal and brain damaged subjects. Other projects have examined the contribution of various features such as shadow, color, motion, and texture to representations of form in order to understand the nature of internal codes for shape, how these codes are stored and how they guide the construction of internal models of the three-dimensional world.

### Evening lecture by Marc Fermigier, ESPCI, Paris

Marc Fermigier was born in Paris, France, in 1955. He has been a student of the Ecole Supérieure de Physique et de Chimie Industrielle de la Ville de Paris, France, and a teacher there from 1982. He is now a professor at the ESPCI. He is a specialist of hydrodynamics, wetting, colloids in suspension, turbulence and instability. In these domains, photographs play an important role in testing hypotheses.

### Tuesday 20 June [Julien Guy](#) (LPNHE, Paris) Images in astrophysics

Julien Guy is a Member of the [Paris SuperNova Cosmology Group](#) and is currently working on the [Supernova Legacy Survey \(SNLS\)](#)

### Wednesday 21 June [John Kulvicki](#) (Dartmouth) Issues in medical imagery

There are two major strands in John Kulvicki's research. The first focuses on perception. How do perceptual states represent and thus make us aware of the environment? How do colors and other so-called 'secondary' qualities differ from shapes and other primary qualities? How should we explain the conscious aspects of perception, or what it is like to see red things, smell roses, and taste wine? The second is in the philosophy of art or aesthetics, and it focuses on the nature of pictorial representation. What makes pictures different from other kinds of representations like diagrams and descriptions? What makes some pictures more realistic than others? How do we use pictures and other kinds of representations as aids to learning about the world around us? These two projects have a lot in common, not so much because perceptual states are like images, but because they investigate different kinds of representational systems: the perceptual systems that we are born with and the artifacts that we create.

### Thursday 22 June Laura Perini (Virginia Tech)

Dr. Perini has research interests in philosophy of science and philosophy of biology, a focus reflecting her background in the life sciences. She studied biology at UCLA and spent time on research in molecular biology and biochemistry. She received her Ph.D. at the University of California, San Diego. Her dissertation was an analysis of visual representations in scientific arguments, a project that combined her interest in philosophy of science and aesthetics with an old curiosity about scientists' dependence on diagrams, graphs, and other kinds of figures. Prior to joining the department at Virginia Tech, she held a position as a visiting lecturer at Connecticut College.

## Teaching plan:

The plenary sessions and the texts provided will be in English.

The assigned texts will be made available to attendees one month in advance. They will be required to send their questions about the readings to the organizers two weeks before the school starts. The organizers will then collect and edit the questions and submit them to the lecturers. The latter at the beginning of their lecture will provide an overview of the subject-matter (for about an hour) and conduct a question and answer session, which will continue for the rest of the morning. This is meant to maximize interaction with the lecturers.

In the afternoon sessions attendees will be requested to work, under the supervision of lecturers, at two small projects: a lexicon of terms relevant for the cognitive study of scientific images, and a taxonomy of scientific images. The groups (4 to 5 people) will work for one and a half hour on the assigned items; one reporter from each group will write a short presentation of the group work. These presentations will occupy the rest of the day, with the lecturers commenting on the different presentations. The aim of the exercise is deepen the issues discussed during the morning session.

Tutors will be present for facilitating informal group discussions.

The journal *Historia and Philosophia Scientiarum* has expressed interest in the publication of an issue devoted to the topic of the school; attendees may consider starting the development of a paper to be submitted to the journal.

## Practical information :

**Venue:** CNRS Biological Station of Roscoff, Brittany, situated in an outstanding natural environment, by the sea-side (<http://www.sb-roscoff.fr>).

Special arrangements may be provided for the physically challenged

### Contribution to fees:

CNRS personnel and MNR PhD students: fee waiver

For national and foreign PhD students (over and above MNR), National non-CNRS researchers and teachers from the public and private sector: free waiver, except for travel expenses.

All interested to join the school are invited to send in the completed form for pre-registration (see below) along with a brief CV and a short letter of motivation and expectations before **April 30, 2006** (by e-mail only) to [marion.vorms@normalesup.org](mailto:marion.vorms@normalesup.org) . The application of doctoral students must be approved by their supervisors (by e-mail) and accompanied by a short résumé of their thesis.

The candidates will be selected on the basis of the documents submitted.

The school is organized around a dedicated work model. In particular, lectures will be delivered in English, texts will be distributed in advance and questions based on them must be sent before the beginning of the school. An active participation is indispensable before and during the school; the selected candidates will agree on respecting the modalities of participation.

### Calendar:

<b>30.04.2006</b>	Last date for submission of applications to <a href="mailto:marion.vorms@normalesup.org">marion.vorms@normalesup.org</a>	
<b>10.05.2006</b>	End of selection process of candidates. Acceptance of candidature is sent to successful candidates .	
<b>15.05.2006</b>	Selected attendees confirm their participation.	
<b>20.05.2006</b>	Work documents are sent to confirmed attendees.	
<b>20.05.2006</b>	Notification is sent to entitled participants Travel documents are sent to the participants (for those entitled)	

## Application form

Should you be interested in participating in the School, please fill in the following form and send it to [marion.vorms@normalesup.org](mailto:marion.vorms@normalesup.org) before **April 30, 2006**. Please cut and copy *in an e-mail*. Please do not send attachments and compose the "subject" of the message as indicated.

-----Cut here : -----

To : [marion.vorms@normalesup.org](mailto:marion.vorms@normalesup.org)

**Subj : Roscoff2006\_application\_SurnameName**

Text of message:

(A) Information :

Name:

Nationality:

Educational qualification:

Status:

Affiliation:

Laboratory:

e-mail:

Personal address:

Personal telephone:

Fax:

Name of supervisor (if you are a PhD student):

(B): CV (1 page max. ; preferably by url)

[...text of CV...]

(C): Letter of motivation (1 page max.) – what do you expect from the school?

[...text of the letter...]

Moreover, for Ph.D. students:

(D): -Résumé of the thesis (1 page max.)

[...text of résumé...]

(E): -An e-mail to be sent by your supervisor stating his/ her approval to your participation in the school.

This information is intended for the organization of the Theme School « The Cognitive Basis of Scientific Images » and for constituting a list of addresses to be used exclusively within the school. You have the right to access, modify, rectify and suppress the data which concerns you. (art.34 of the French law "Information Technology and Liberties"). To exercise your right write to Roberto Casati, Institut Nicod, 1 bis avenue de Lowendal, 75013 Paris, France.