

Conference Program

Presentations including 'Marlot'

Comparing Human and Artificial Scientific Images for Learning Enhancement

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In this contribution, we develop a two-level discourse on scientific images.

In the first part, we focus on scientific images produced through human gestures. As Dondero (2015; see also 2024) argues, the scientific image has a Peircean diagrammatic function: it increases knowledge through the manipulations and experiments performed on it. We show how this function unfolds in a specific way of “reading images” based on two main features: the nonlinearity of reading and the dependencies between the whole and its parts (Bordron 1991; Goodman 1977). In this sense, the visual interpretation of images cannot be considered a mere duplication of accessing verbal texts.

We then argue that the meaning of the image must be understood through two levels of value circulation (Paolucci 2010). The first is the level of textual immanence, which allows us to conceive of the image as a signifying totality and to analyse its internal relationships and connections according to categories selected for the purposes of analysis: the topological, chromatic, and eidetic categories of Plastic Semiotics (Greimas 1984), as well as the texture as enunciative apparatus (Dondero 2020). The second is the level at which this value is exchanged with what lies outside the image-text. In the specific case of the scientific image, we often encounter a meta-textual foreground, in which the representation of an object, a method, or a scientific process is placed within another text belonging to a different semiotic system, such as verbal language. These interpretative circumstances require a work of translation that we define as *intersemiotic translation* (Jakobson 1959, D’Armenio et al. 2025; Dondero & Fontanille 2012; Eco 2012; Dusi 2000). A further external factor concerns the comparison between the value produced by the image and the knowledge brought by the observer’s competences regarding the represented phenomenon, as well as the relationship between that phenomenon and its terminus a quo (Eco 1997), which activates the semiosis of the graphic representation under examination.

In the second part, we compare scientific images produced through conventional scientific practices with scientific images generated by text-to-image systems (e.g., Midjourney). First, we consider the relevance of the connections among the data on which these systems depend. In the automatic analysis of large corpora, such connections can assume different configurations of meaning depending on the neural architectures and algorithms used to explore the datasets. Second, we examine how these different ways of identifying relations among data (attention mechanisms, cosine similarity, segmentation, and other procedures) have a substantial impact on the rendering of the scientific image.

In the context of scientific images for didactic purposes, the generation of synthetic images appears particularly useful for producing tailor-made educational resources and for personalising content. Our analysis therefore aims to define a perimeter of usability for artificial scientific images within educational practices (Mayer 2020). We showcase a corpus of scientific images drawn both from instructional materials and from multimodal generative AI systems, organised into three categories: objects (e.g. the cell), methods (e.g. how to use the microscope), and processes (e.g. the water cycle).

Session Details:

B.04. Democratic Access to Scientific Knowledge through Graphic Reasoning and Visuo-Quantitative Literacy

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