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SCIENCE AND SOUTH PARK, REDDIT AND FACEBOOK, LEONARDO DA VINCI AND THE VITRUVIAN MAN, AND MODERN FAIRY TALES ABOUT EMERGING TECHNOLOGIES: SCIENCE COMMUNICATION AND POPULAR CULTURE

Visual communication, popular science journals and the rhetoric of evidence

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Abstract

While the use of scientific visualisations (such as brain scans) in popular science communication has been extensively studied, we argue for the importance of popular images (as demonstrated in various talks at #POPSCI2015), including pictures of everyday scenes of social life or references to pictures widely circulating in popular cultural contexts. We suggest that these images can be characterised in terms of a rhetorical theory of argumentation as working towards the production of evidentiality on the one hand, and as aiming to link science to familiar visualities on the other; our example is da Vinci's "Vitruvian Man".

Keywords

Popularization of science and technology; Visual communication

For many neuroscientists the popularity of modern brain research relies on their scientific standards and powerful instruments such as non-invasive measurement techniques (which, incidentally and for convenience only, produce images). In contrast, science and technology studies argue that the popularity of brain research is primarily linked to the persuasiveness of the visualisations produced by brain imaging technologies in the context of popular science communication. In both cases, you might expect that science journalism mainly uses brain scans to demonstrate the verisimilitude of modern brain research — and thereby first of all produces what might be called "popular brain research" [cf. Heinemann and Heinemann, 2010; Heinemann, 2012; Hans Peter Peters et al., 2013, pp. 328–329]. But a phenomenology of popular science media and contemporary science journalism has to include other pictures, which adopt, cite and transform elements of popular culture to promote and contextualise science as part of social life and individual life worlds. How to approach this variety of pictures within the so-called "Pop Science" [Kaeser, 2009; cf. Allgaier, 2010] of today?

Such a phenomenology should be able to take into account that the suggestive rhetoric of self-evidence (for instance of cerebral "activation patterns") both takes part in a broader visual culture and likewise uses visual culture as a source for pictorial strategies, which raises the questions of visual evidence and of the rhetoric of pictures: "Visual culture signifies the variety of practices of production and

dissemination of all kinds of images as well as concepts which underlie visual perception, practices of looking and visual representations. Moreover visual culture comprises the rhetoric of pictures and discourses of iconoclasm and idolatry." [Frank, 2008, p. 473, our translation] So, when we face the visual culture of popular science communication, for instance within print media such as popular science magazines like (Spektrum) *Gehirn & Geist* (*Brain & Mind*, subtitled "*The Magazine for Psychology and Brain Research*") or (Scientific American) *Mind* (subtitled "Behaviour, Brain Science, Insights"), which popularize modern brain research, there seem to be at least two ways of approaching the images: we could have a look at the scientific visualisations (for instance functional brain scans) which try to convince us of their truth and evidentiality in an epistemic manner and follow these images around, analysing their translational chains and contexts of persuasion, their assertions and aesthetics — and their reception by the audience. This path follows the trace of evidence and certainty for functional brain imaging [cf. Dumit, 2004; Burri, 2008b; Joyce, 2008].

But if we suspend questions of epistemic evidence and visual self-evidence, we might just as well view visualisations within popular science magazines (as well as TV documentaries, SF movies etc.) as media of 'getting caught' by pictures. This second way of observing the visual culture of popular science communication analyses its "visual rhetoric" under the premise that many of its pictures appeal to the reader as "manifestations of vividness". If we want to address popular science magazines of today, we therefore should be willing to transform and reconfigure philosophies of evidence [cf. Kelly, 2014] and of "pictorial scientific knowledge" or "visual arguments" [Mersch, 2006; cf. Heßler and Mersch, 2009] to accommodate the use of popular and entertaining images within visual science communication. In other words, we should take into account those motifs, 'atmospheres' and styles which trigger the feeling of 'being familiar with an image' — an affect which first and foremost is produced by other than scientific pictures (though even these emotionalise their audience through "aesthetic seduction" acc. to Burri [2008a, p. 350]). The benefit of such an approach to visual science communication by means of a "rhetoric of evidence" might be twofold: a) popular science culture will no longer be conceptualized as mere postscript of the scientific production of knowledge, as parasitic on hard science practices of studying the brain, and b) non-scientific, illustrative pictures will be viewed as integral elements of popular science.

The rhetoric of images: from evidence to hypotyposis

If you consider popularization to be a process that departs from scientific insight into the nature of the workings of, for instance, brain and mind, and mediates that specialised knowledge to a public, it is the pictures resulting from functional brain scans that take centre stage. They substantiate the neuroscientific findings presented in a form palatable for the general reader by visually anchoring them in scientific observation, thus providing a factual ground to fall back on. On the other hand, if you consider popularization to be not so much a 'transfer' or 'transformation' of scientific knowledge that precedes it, but a genuinely productive mediation on the cultural relevance of such knowledge, it is the pictures of everyday activities and pop-cultural icons that come into view most prominently. They suggest to readers what to do with and how to look at the facts generated by science and reported by science journalism, linking them to experiential knowledge and familiar frames of reference.

Small wonder that, quantitatively, what we find in popular science magazines is a small selection of functional brain images, juxtaposed to a plethora of pictures depicting everyday scenes in brain- and mind-related contexts (most of them liable to human enhancement as, for instance, education; [cf. Gransche and Hommrich, 2015]) or combining brain images with the repertoire of culturally memorized images, deriving from a variety of sources both high art and popular (that is, roughly, from Renaissance painting to contemporary film, see below). Reputable popular science magazines as *Gehirn & Geist* (G&G) or *Mind* may seem to look like entertaining products of boulevard journalism on first sight while their articles demonstrate state-of-the-art science journalism [Heinemann and Heinemann, 2010, pp. 292–293]. But if we take into account that we can find plenty of social images such as (portrait) photographs of experts as well as ordinary people and everyday scenes the question regarding the visual diversity of popular science is: How are we to conceptualise the qualitative premises underlying this distribution, which favours seemingly illustrative pictorial padding over epistemically informative core images?

We suggest that these two classes of images belong to different orders of discourse which can be characterised in terms of a rhetorical theory of argumentation. While (primarily) functional brain scans are used to persuade recipients of popular science communication of the evidence-based character of its representation of the brain and its workings, those 'other' cultural images serve to relate the reported findings both to our everyday lives (people, activity, things/objects) and to our received schemas of understanding. Which is to say, that the former 'hard' images, which are stills of cerebral processes, aspire to the status of evidence and we get a characterisation of their procedure from classical accounts of *evidentia*, minus one level of mediation (that of language): "The object as a whole has an essentially static character in *evidentia*, although it is a process [. . .]; it is the description of a picture which, although its details are in motion, is contained within the limits of a (more or less loose) simultaneity. The simultaneity of details, which conditions the static character of the object as a whole, is the felt experience (*Erlebnis*) of simultaneity in the eyewitness" [Lausberg, 1990, p. 400; transl. in Beaujour, 1981, p. 29].

In other words, the persuasive power (the performative force, if you like) of these pictures results from their attempt to put their recipients into a position which allows them to virtually see the workings of the brain *as if* they had been able to see them for themselves. Of course, this is just a rhetorical, or rather, pictorial effect, as these brain images are themselves the result of an attempt to visualise numerical data generated by so-called 'imaging' apparatuses according to various cultural codes (among them the parameters of colouration on a red/blue scale, etc., [cf. Isekenmeier, 2013, pp. 31–32]). They are, however, perceived as attesting to that which they give to see, thus assuming the status of *tekmérai*, "ce qui tombe sous les sens, ce que nous voyons [. . .]: les indices sûrs" [Barthes, 1970, p. 204]. As pictorial arguments, they aspire to be *enthymema*, inferences with a certainty only surpassed by syllogism [cf. Lausberg, 1990, p. 199]. As this is the kind of reasoning associated in ancient times with the *juridical* discourse [Barthes, 1970, p. 210], the English word 'evidence' has largely retained the forensic dimensions of its original meaning [cf. Beaujour, 1981, p. 29]. The epistemic pictures of functional brain imaging thus serve to persuade us of the truth(fulness) of neuroscience's factual foundation: they allow us to 'see' the brain at work.

The 'soft' images, on the other hand, which relate to the everyday and to culturally sedimented meanings, aspire to a vivid representation (vividness as both liveliness and clarity), which can be related to the figure of *hypotyposis*, a rhetorical strategy that is supposed to render states of affairs as living scenes, in the sense of something that is also placed before our eyes, but in accordance not with an evidentiary procedure, but with usage or the plausible. Their status is thus that of *eikota*, instances of the probable as a general idea which relies on judgements made on the basis of experience, of imperfect *inductions* [Barthes, 1970, p. 204]. As this is the kind of strategy associated in ancient times with *epideictic* discourse [Barthes, 1970, p. 210], whose primary function was the stabilisation of socio-cultural orders [Pernot, 2015, ch. 3], it can be inferred that the presentation of neuroscientific content in the context of common-places about the brain and its functions, serves to connect specialist knowledge with pop-cultural preconceptions of its relevance. What we popularly think about the brain is thus not a result of our scientific knowledge which needs to be 'translated' by the science communication of journalists, but is the very condition of possibility for its perception as knowable.

We can think of the difference of order between the two classes of images as relating to different degrees of certainty: "Que tenons-nous donc pour certain?" [Barthes, 1970, p. 204; cf. Dumit, 2004, pp. 19–21]; or we might actually have to consider the commonly assumed as the prerequisite for the credibly demonstrated (Lausberg [cf. 1990, p. 198] acc. to whom logical inference presupposes experience, or *enthymema* premise *eikota*). If anything, it is the photograph of a familiar social (for instance educational) situation, or the interpictorial reference to a cultural icon, that clears the ground for our perception of epistemic pictures rather than the other way round.

Pop Culture and Pictorial Reference

"Vivid representations" enable readers of G&G to both recognize and view the reports on brain science and its results as 'natural' constituents of their life world: leafing through the pages of the popular science magazine, the variety of visual representations within G&G includes pictures of scientific objects as well as modern art, advertising images or cartoons and they comprise photographs of persons as well as pictures of playing children or someone learning. Roughly speaking there are at least two types of "vivid visualisations" which are used in this arena of popular psychology and popular brain research. First, one might observe visual representations that remind 'us' of social contexts and scenes (like photos of people and cartoons). In a way, this type of "vivid visualisations" calls on personal memory; these images seem to be 'close' to 'everyday life' or 'ordinary objects' and they might function as pointers (not to scientifically proven propositions but) to the sociocultural relevance of the science or scientific study in question.

In comparison, the second type of "vivid visualisations" comprises pictures that have been adopted from the communicative and cultural memory which we might refer to as pop (media) culture. While images that suggest that they refer to social life are only accessible by means of introspection of a recipient, this second type of images refers to the importation and translation of well-known images as well as to the staging of famous icons. Supposing that such adoption from, that is, reference to popular culture does effect the connectivity of and increases the emotional impetus and affectivity of (visual) communication, this type of "manifestation of vividness" might be seen as sign of the popularisation of (brain) science by visual

cultural means. In *G&G*, there is an almost overwhelming visual plurality of popular images. Lessons both about (the) state of the art within science journalism and popular (visual) culture can be learned from pictures that refer to the sinister cineastic atmospheres of *Alien* (the film poster, 10/2009, 48), of George Lucas' *Star Wars* (6/2004, 49) or to the Ludovico technique scene of *A Clockwork Orange* (6/2011, 80). Likewise, we encounter familiar figures of TV cartoon series (for instance Vicky the Viking, 9/2008), of advertisement, religion or esotericism (*Yin Yang*, 3/2003, 14) and art (for instance Auguste Rodin's *The Thinker* (10/2010, 51). Most of the pop images used by G&G are used within just one issue or an article, but some cultural icons like the image of Sigmund Freud (1–2/2006; 11/2012) or the *Vitruvian Man* (VM) are taken up in several issues (11/2005, 51; 6/2009, 14; 5/2010, 31) and for different purposes.

G&G repeatedly adopted the work *The Vitruvian Man* (around 1490) by Renaissance-genius Leonardo da Vinci, which is incorporated into a whole interpictorial series of pictures. The picture refers to the anthropometric visualisation and illustration of a text passage by Roman architect Vitruvius [cf. McEwen, 2003; Larsen, 2005]. Da Vinci's well-known geometric study of ideal human proportions (*Le proporzioni del corpo umano secondo Vitruvio*) nowadays certainly is both a famous piece of art (history) and an inherent part of pop culture: the unique drawing is stored in the Accademia gallery in Venice and simultaneously the work has its own life as a popular icon. The popularity of VM depends upon its iconic quality. Some people may have come to know the image in school, others may have seen VM in everyday life or in the media. The dissemination and circulation of the iconic use of da Vinci's drawing can be tracked when we recognize the VM on the Italian 1€-coin or on German public health insurance cards; it can be found on the cover of books or on conference posters; someone may associate one of the innumerable examples staging VM as product boosting icon in films like *The Da Vinci Code*, *The Hitchhiker's Guide to the Galaxy* or *Idiocracy*. The icon was also used for the video game *Deus Ex: Human Revolution* and for Homer Simpson — as ideal man. Other examples use VM in the logo of the local fitness studio or pizza place and some of us may remember their energy drink in the supermarket.

As highly mediated picture, the image bears plenty of denotations and connotations so that adopting VM may refer to da Vinci as historical and mythical figure of the Renaissance or to (occasionally plain) meanings such as "human body", "perfection of man" (lat. *homo bene figuratus*), "plasticity of man", "culture", but also "medicine" or "health and fitness", "geometry", "measurement", "scientific spirit" etc. An analysis of the images which draw on this cultural icon shows that the function of reference varies. Studying the da Vinci drawing within (and as an issue cover of) G&G teaches us about the different uses and the semiotic flexibility such pop images have in popular science journalism. The strategies of adopting, styling and contextually embedding this popular image range from the affirmative quotation of VM to satiric use: in G&G (11/2005, 85, passim 3/2006, 6), VM is combined with an iconic representation of the brain organ; we find an image of VM as a figure of puppetry on parchment-like background: the threads of VM as puppet are controlled by a hand reaching out of a brain at the top of the image. Here, the iconic meaning of VM is part of a pictorial travesty subverting the meaning of the supremacy of (the ideal) man — mastered by the brain as higher actor. Even more, the icon of VM misses the geometric lines of da Vinci's drawing,

which symbolise (cosmic) order; instead, the puppet master (the brain) holds strings ("nerve strings" as the commentary says). In short, da Vinci's drawing is used to promote and emotionalise the topics and context of a specific statement or metaphor by means of different functions of reference. Broadly speaking, when using the rhetoric of evidence (or, rather hypotyposis), popular images and different functions of reference, G&G adopts "the variety of practices of production, dissemination of all kinds of images as well as concepts which underlie visual perception, practices of looking and visual representations" [Frank, 2008, p. 473, our translation] to both gain and raise attentiveness of its — thereby potentially expanding — target audience.

Conclusion: beyond the epistemic regime

We certainly do not want to argue against the merits of a critical approach that traces 'science' in communication and follows the translations of 'true and proven facts' and their visualisations in processes of popularisation of scientific research or technologies [cf. Dumit, 2012]. However, such an investigation into the popular pictorial staging of the results of neuroscience seems to have already bought if not into the epistemic claims of scientific knowledge production themselves, then at least into the general focus on questions of evidence and truthfulness. Opening up the pictorial horizon of STS of the neurosciences, the analysis of, for instance, G&G demonstrates that popular images do have a stake in communications of 'cutting edge' research domains. That epistemic claims of evidence have to compete with 'non-epistemic knowledges' means that we need to explore 'dilettante notions' of the brain, of the neurosciences and, last but not least, 'our' self-fashioning with 'neuropopular knowledge'. While our comment tried to come to terms with the pictorial sites of the transition from epistemic pictorial arguments to pictures appealing to common sense, on both sides of the pop/science divide, a multitude of images only waits to be explored, from tables and diagrams (more closely appealing to syllogistic, or at least mathematical/statistical modes of evidentiality) to brain scans on the one hand, to photographs of everyday scenes, references to popular icons, and cartoons (one of whose ecological function in this discourse might be to integrate and appropriate dissent) on the other [cf. Hüppauf and Weingart, 2009]. It would be a shame to abridge this diversity to the seemingly central visualisation provided by brain imaging apparatuses — or by scientific imaging regimes in general.

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