Projecting Possible Lines of Sight for RSSTM

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Detailing possibilities and prospects for rhetorical studies of visuality and visual representations in science, technology, and medicine (hereafter, STM) presents a challenging task. After all, if we take Galileo's use of the telescope as a convenient starting point, technical developments enabling scientists to focus their attention ever more precisely on phenomena that are otherwise inaccessible to direct and unmediated observation have both a long history and a recent trajectory of rapid growth. The sheer range of visualizing media is daunting, ranging from humble diagrams and sketches to advanced computer-generated images that now re-project almost every part of the energy spectrum into the narrow ranges of light accessible to the human eye. And the issues raised by these visualizing technologies vary across specialists, broad technical communities, and the general, globalizing public.[1] Moreover, rhetorical studies of visualization in STM are in a preliminary phase. The best our group can offer is a survey of selected areas where rhetorical studies of science, technology and medicine (hereafter, RSSTM) seem oriented at this very primary stage.[2]

Perhaps the most acknowledged theme of immediate importance in RSSTM is exploration of the relationship between visual and verbal dimensions in specific communications of or about science, technology, and medicine. When confronted with visualizations during analysis of cases in context, rhetoricians have grappled with this question: How do verbal depictions influence the way visuals are seen and how do visuals constrain the meaning of what is said or read? This question requires examination of how verbal and visual choices enact perspective toward that which is displayed in situated context. Put generally, if all symbol use involves the "screening" function that Kenneth Burke attributed specifically to language, then visual as well as verbal symbolizations are susceptible to rhetorical description and analysis, whether separately or in some combination.

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1 See Keller (2002) for an analysis of issues arising from the use of computer technology and visualization in developmental biology.

2 Our discussion group included the authors and Julie Homchick, John Lyne, G. Thomas Goodnight, and Damien Smith Pfister.

Setting out exploration of the verbal-visual nexus as a major thematic locus does not presuppose which analytical resources are most useful in disclosing the rhetorical operations of visual images in specific cases. Indeed, we might need first to ask: What conceptual resources are *available* for rhetoricians to describe and disclose the rhetorical aspects of visual representations in science communication? Current discussion seems divided into two positions. One position is that conceptual resources traditionally used in analysis of linguistic texts are transferrable in analysis of visual representations, with or without adjustment. This line of thought might presume, for example, that metaphors are not easily dismissed as misleadingly reductive in the analysis of visual images because they are necessary as generative, creative instruments that enable users to get at phenomena, define their boundaries, and establish fertile horizons for inquiry, discussion, and representation. Rhetoricians have disclosed visual manifestations of tropes not only in advertising and political cartooning, but also in science (Prelli, 2006). Fahnestock's (1999) *Rhetorical Figures in Science* illustrates both verbal and visual manifestations of figures in science communication that originally were articulated in works such as *Rhetorica ad Herennium* and Quintilian's *Institutio Oratoria*. Still other prospects include examining visual images in relation to developing public narratives about STM.

The other position is that analytical resources used predominantly in analysis of linguistic texts cannot be transferred for use with visual images without leaving important distinctive features out of account. This line of thought presumes that visual images consist of significant elements unlike those that constitute verbal tropes and figures. While the constituent features of the latter are discretely identifiable words, visual images consist of properties such as color, form, size, and contrast. For example, Jamie Landau and her colleagues (2009) reported key themes of viewer responses to images of nanotechnology. Their participants' responses to the verbalized concepts of nanotechnology appeared to be more fragmented than the typical responses given in interviews. For example, participants described the brightness of the light in one image as calling to mind the light qualities of skyscapes. But they didn't describe the nano-tech *as* a sky. Although this is a partial comparison, the process does not appear to be identical to metonymy or synecdoche, because the re-representation does not make the move to completion—the nano-object is not represented "as" the sky. It is just said to call up the feelings or memories of sky images. Obviously, more detailed work is needed on such questions and their implications for processes of scientific interpretation.

These contrary positions generate theoretical as well as analytical questions about rhetorical studies of visual representations in STM. What is the place of rhetorical invention in the generation of visual representations, if any? What are the implications for rhetorical studies of visual representations of findings in cognitive psychology that language and visual images are processed differently, if any? Will work examining relationships between figures of thought and cognitive psychology open up productive theoretical and empirical points of cross disciplinary collaboration? What relevance, if any, will such collaborations have for

conducting rhetorical analysis and criticism of visual representations in the context of particular situated cases? To what extent must rhetoricians do science to do criticism?

At this point in RSSTM, given the wide range of contexts for communications of or about STM, rhetoricians must remain open to a variety of possible analytical resources in their efforts to unlock the rhetorical operations of visual images and representations. No single answer will likely serve for *all* RSSTM. We do think at this preliminary phase that theoretical responses and determination of the critical utility of selected conceptual resources for disclosing the rhetorical dimensions of verbal or visual images, singularly or in some combination, are best developed in relation to detailed case studies, in view of the contexts integral to the "message" of the communication examined and to its situation. Undoubtedly, there are conceptual possibilities for working out responses to the question of the best available analytical resources that are not considered here or envisioned in current discussions in the field.

RSSTM will increasingly confront questions about the truth or accuracy of images given the advent of digitalization in laboratory and other work. The ease with which images can be manipulated gives rise to concerns about where to draw the line between permissible "adjustments" to enhance clarity and prohibited alterations that misrepresent what is seen. This question takes on even greater rhetorical significance when we recognize that *all* technology of visualization involves multiple decisions that influence what is ultimately seen. The field of rhetorical studies is now beyond the stage of merely establishing the rhetoricity of the visual representation process, and might profitably begin to engage questions of degree and type. Are there differences in the range of truth-values (understood as functional utilities) or of truth-conditions (perhaps created as community rules) among technologies that employ different kinds of media or different types of processes for visual representation? For example, are different truth effects typically produced by drawing, digital photography, and the use of scanning tunneling microscopes to represent phenomena (as in the range of Google Images of gold atoms)?

Another important area for investigation is the level of expertise required of those who become audience to visualizations in STM if they are to be said to understand or critically assess them. Without undergoing a process of learning to see it is unlikely that a viewer, say, could discern the structural features of DNA alluded to in the text of Watson and Crick's famous announcement in the accompanying X-ray diffraction image.[3] Those equipped to "read" the image, though, would discern the image's implications at a glance as authorizing structural claims that would be incomprehensible to the uninitiated. The matter of who becomes audience to visual representations becomes all the more salient when the science involved has important political, social, or economic implications.

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[3] Jack (2009) engages the theme of "learning to see" by disclosing how Robert Hooke enacted a "pedagogy of sight" rhetoric that taught readers how to see engravings from the vantage of his preferred ideological and epistemological position.

For instance, computer generated images of the ozone "hole" could resonate differently with audiences of varying expertise. The so-called "climate gate" emails were seized by the uninitiated as evidence of a "hoax," while professionals used to presenting data visually might interpret them as no more than a frank discussion about how best to present data to an audience of peers. The notion of rhetorical strategy in the presentation of purported facts is incongruous with those portions of the citizenry who surmise that "facts" are adduced through straightforward description (as though that is easy). And, of course, there always is the possibility of mystification by deploying images as evidence that can only be legitimately interpreted with a single, specialized set of rubrics that are not widely shared. As with all rhetoric, the relationship between audiences and visual images is a concern of central significance to RSSTM.

The rhetorical problem of visualizing phenomena relevant to public and policy deliberations is of increasing importance, especially when those phenomena are not susceptible to direct observation. How under those circumstances do scientists and other specialists get inexpert but politically important audiences to "see" the problems? The computer generated ozone "hole" image was especially resonant and, thus, became a resource for advocacy of the Montreal Protocol. The so-called hockey stick graph plotting global temperature against units of time is among the visual resources for establishing the reality of global warming, but it shares this place in the public discourse with photographs and films of severe storm events, images of decreasing arctic ice, and even the widely circulated digital image of a polar bear clinging to a small ice float. To take another example, it is difficult to conceptualize, much less visualize, geologic time. How is that problem addressed in public communication? Analysis of cases concerning visualization of these and other phenomena that can become politically charged in particular public contexts sets an important line of inquiry for RSSTM.

The varied media of visualization and the contexts of their usage set a very broad and fertile range of opportunities for RSSTM. Is there a relationship between the medium and the visual tropes of science that are circulated? For instance, do still photography and time-lapse photography privilege the same or different figures? The images incorporated in the practices of STM will be contingent upon a variety of situational factors, including but not limited to the problems addressed and the disciplines involved, as well as political and social contexts. CT scans, PET scans, MRIs and MRAs are used routinely in a wide range of medical contexts. Disruptions of routine uses of particular media afford opportunities for rhetorical inquiry. For example, "virtual colonoscopy," which involves combining CT scans into 3-D views of the large intestine, is emerging as an attractive—and more expensive—alternative to use of the colonoscope, an instrument that illuminates and brings the colon walls into view more directly (i.e. without intervening bodily tissue). Here is an opportunity to examine the emergence of a new imaging procedure in relation to both clinical and economic constraints.

Public communication about STM provides yet another wide array of opportunities for RSTM. One particular line of analysis and criticism is to

examine what is shown and how in the design and arrangement of displays in natural history and science museums (Allison-Bunnell, 1998; Dyehouse, 2011), including forms of 3-D objects, such as dioramas. Another is examination of celebratory public spectacles, such as the "retirement" of the space shuttle *Atlantis*. Still another line of inquiry is public reportage and visualizations of technological, medical, or scientific "breakthroughs" in popular media. Indeed, images of STM permeate much of daily life through advertising, television, and film and, thus, can be examined for their rhetorical influences. Considered from a different vantage, RSSTM might examine what citizens do with such images by cropping, splicing, and circulating them in enacting distinctive rhetorics of their own (Landau, 2012). And the development of new technologies such as "mobile apps" (e.g., iCell®) that is accompanying the globalized expansion of on-line science education continues to muddy the lines along which explorations of "science education" and "science journalism" might be said to increasingly entail learning to recognize visual enactments rather than learning concepts.

Our challenge in describing the opening lines of research in visual rhetorics of STM is obviously dwarfed by the work required to pursue these avenues of exploration. It is impossible to predict which of these avenues will gather the attention of rhetoricians, and which will be most fruitful. But there is clearly (visual metaphor intended!) plenty left to be seen.

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