There's More to the Camera's Obscura Than Meets the Eye[1]

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As one might expect of a book titled "Stop Motion and Fragmentation of Time," many of the contributors were concerned with, as the conference call put it, "fragments of reality through a shooting device." My self-appointed task is to be oppositional. But because I fully share the organizers' goal of opening new perspectives on the intermedial practices within which cinematography first appeared, perhaps I should more accurately describe my approach as "complementary." I want to begin with a series of questions: What alternatives can we find to fragmentation and stop motion? Does an atomized notion of space and visual experience (a representational tradition predicated upon the fracturing of visual experience into static images that are in turn re-animated) assume an atomized or ruptured notion of time? Are other temporal orders (for example, time as flowing and continuous) possible? Have there been other relevant moving image-technologies that have attempted to circumvent the process of fragmentation and re-animation, and if so, how might these help to re-contextualize and locate the technologies of fragmentation that film embodies?

To take the last question first, I will argue that there was indeed a relevant moving image technology that was free from the inherent temporal fragmentation and delay of the photographic image. The technology to which I refer might most appropriately be called "television," even though most of my analysis will focus on expectations regarding a representational tradition that might better be called the "televisual." My view is rooted in an ongoing research project that situates the televisual as a key intermedial context for the emergence of film. Such a context opens up new readings of film's historically perceived representational capacities, and quite possibly renders film as the great compromise, rather than the great wonder, of the nineteenth century. The reason for my shift from

the object "television" to the condition "televisual" has to do with the ideal-typical status of a medium that was fully imagined and partially technologized in the last quarter of the nineteenth century, but that failed to prevail as a significant material practice. It refers to a discourse of liveness, a technology of visual contiguity and simultaneity with the lived world, something rather closer to the telescope than to the photographic camera. I will argue that the televisual constituted a specific element in the horizon of expectations that greeted film, and raise some questions about certain early film practices which might be re-read in light of this context. Moreover, I would like to use this opportunity to examine much earlier traditions of "moving image" technology such as the sixteenth century camera obscura, in order to argue that our intense concern with visuality has caused us to overlook temporality, a dimension that is obviously crucial to our thinking about moving images. Of course, we often think about media and temporality, but as this conference attests, it is most often in terms of stasis, fixate strategies for re-animation, and illusion.

Heresy

As part of the task of reclaiming ideas about flow, simultaneity, and technologies of visual contiguity with the lived world, to see how they might have shaped the horizon of expectations for the film medium, I need briefly to recapitulate elements of a heretical view that I have published elsewhere.[2] Although one can trace the idea of moving image transmissions back to the distant past (one commentator goes back to the ancient Egyptians), I think we can speak about the televisual in a specific sense with the coming of Bell's telephone in 1876. The telephone sparked an anticipatory concern about visual systems that could share the instrument's ability to link distant locations point-to-point in real time. This consensus took the form of verbal and graphic descriptions in both the scientific and popular press, as well as technological invention and patenting. For their inspiration, authors of these reports and inventors of these new devices drew not only upon the telephone, but also upon the telegraph, especially the picture-telegraph that had been in service since the 1850s, the magic lantern, photography, and, after its introduction in 1878, the gramophone. Although a wide range of possibilities were described, most shared several characteristics: an explicit integration of the liveness and point-to-point links offered by the telephone; a projected two-dimensional visual display (in a rectilinear or oval frame) informed by the magic lantern and photography; and "live" moving images with which spectators could interact in real-time. As we shall see, this vision

was additionally enlivened by a clear sense of genres and a full-blown taxonomy of applications.

The supporting evidence for this imagined television apparatus can be found in many domains. In June 1877 *L'année scientifique et industrielle* included a description of the "telectroscope," a device attributed to Alexander Graham Bell that supposedly sent live images over a distance. Within two years of Bell's invention, a now famous cartoon appeared in Punch which showed a girl in Ceylon speaking on the telephone with her parents in the United Kingdom by way of a wide-screen "electric camera-obscura" attributed to Edison.[3] By 1883, Albert Robida would provide his full-blown science fiction description of the "telephonoscope", an audio-visual technology that could bring distant entertainment into the living room, and serve as a means of surveillance, as well as serve the mission of *"la suppression de l'absence"* by facilitating real-time face-to-face communication over vast distances.[4] Robida's "prediction" of television, like the prognostications of some of his contemporaries, offers a striking instance of technological anticipation, but it also speaks to the long history of ideas, urges, and attempts that infuse our most recent understanding of "new" media (Fig. 1). Thanks to these inaccurate reports and science fiction fantasies, simultaneity, a quality the popular imagination already defined by and experienced in the telephone, was understood as an attribute that a visual medium could possess as well.

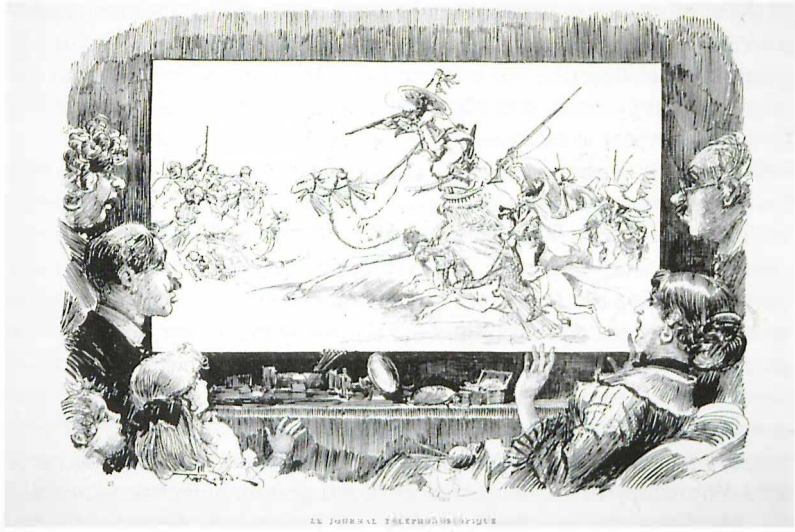


Figure 1 : Albert Robida's depiction of television news, *Le journal téléphonoscopique* (1883).

If the televisual enjoyed a period of rich development as an imaginary technology shortly after the invention of the telephone, certainly the material base that it held in common with the telephone also enjoyed a long pre-history – at least as long as the one we attribute to the film medium. For example, Daguerre's and Fox Talbot's 1830s experiments, milestones so central to cinema's development, might be paralleled to Samuel Morse's 1837 demonstrations of an electronic telegraph; Reynaud's projecting praxinoscope or Muybridge's zoopraxiscope, both from around 1879, might be paralleled to Bell's voice telephone of 1876. Edison's and the Lumières' patents for the moving picture camera and projector might be paralleled to the patent for what would become the first working television system: Paul Nipkow's 1884 patent for the *elektrisches Teleskop*, the so-called "Nipkow disk," a key component of mechanical television systems up to the early 1940s.[5] Nipkow's system permitted the instantaneous "dissection" of images, their transmission as electrical signals, and their "reassembly." By 1889, Lazare Weiller's Phoroscope proved capable of much the same task, except that in place of a spinning disk, Weiller used a revolving drum made of angled mirrors. Nearly one hundred years ago as projected moving pictures first graced the screen, Charles Frances Jenkins designed his Phantascope, a name that indicated two devices: an Edison patent-breaking moving picture system co-designed with Thomas Armat, and a television system that promised, but so far as we know, failed, to transmit simple shapes.

Whether imagined or technologically deployed, one striking feature of these proto-televisual forms was their emphasis on a notion of liveness and experiential contiguity, an emphasis that can be seen in the language used to describe the new medium. In German, for example, the most commonly used term for television *(Fernseher)* was appropriated from the identical word meaning "telescope" with the result that this latter definition has grown archaic (Fig. 2). More commonly, however, new terms were invented, blending known technologies of liveness together with electricity: the telectroscope, the telephonoscope, the electronic camera obscura, and Nipkow's just-mentioned *elektrisches Teleskop* (Fig. 3). During the last quarter of the nineteenth century, a number of inventors, writers, cartoonists, and presumably even some portion of the general public, connected the idea of moving images with the ideas of liveness (defined as simultaneity, and embodied in the telephone), and extension (defined as seeing from a distance and embodied in the telescope). This is not to deny that alternate conceptual models were available. For example, the development of the gramophone two years after the telephone and the ability to store the ephemeral element of sound led to developments such as Wordsworth Donisthorpe's eight for motion picture camera and projector, patented in 1889.[6] Nevertheless,

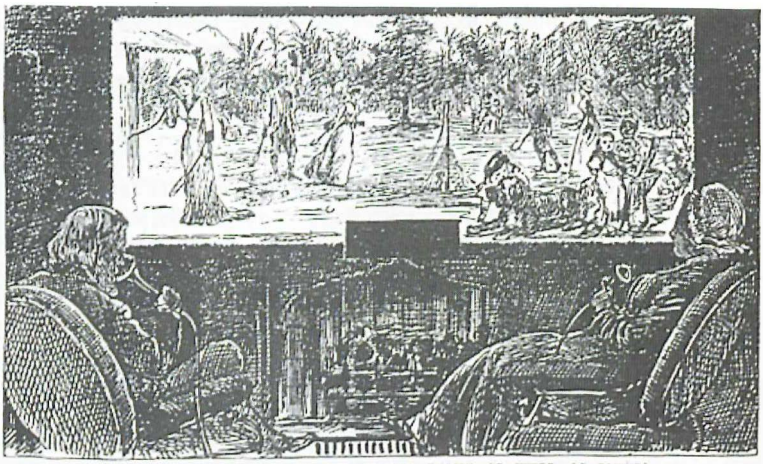
Figure 2: Before the elektrisches Teleskop... a 19th century advertisement for the Fernseher.

I want to suggest that the horizon of expectations that greeted the moving picture medium in the course of the next decade was shaped by a number of ideas about simultaneity and flow, and that technological developments such as Nipkow's disk constituted tangible elements in that horizon.

Time and the Temporality of Viewing

The attempt to recover the intermedial space that early television and film inhabited raises a number of questions having to do with time. Stephen Kern has offered a compelling portrait of the competing notions of temporality vying for dominance in fields such as philosophy, psychology, and physics during the last quarter of the nineteenth and beginning of the twentieth centuries.[7] For the purposes of this essay, we can simply make a quick heuristic distinction between two contrasting traditions of thinking about time within which the televisual and film may be situated.[8] This distinction can in turn be teased out by examining representation systems, viewers and the viewing experience, and philosophical systems; in short, by considering the *dispositif* implied by the various technologies, whether televisual or cinematic.

To begin, we have the familiar tradition of conceiving time as fragmented and atomized. This notion is heavily, but certainly not exclusively,



EDISON'S TELEPHONOSCOPE (TRANSMITS LIGHT AS WELL AS SOUND).

Figure 3: Edison's Telephonoscope (*Punch*, 1878).

indebted to the mechanical and analytic traditions of the eighteenth and nineteenth centuries, in which motion could be dissected and reactivated. This view, which in fact can be traced back to the pre-Socratics, has been central to the "Stop Motion and Fragmentation of Time" conference, and underlies much of our thinking about the film medium. The twentieth century version of this model of temporal fragmentation repositions the phenomenon in terms of modernity. Stephen Kern and David Lowe, for example, see film's ability to speed up time, to freeze it or even reverse it as emblematic of the modern (and the relative), as well as of twentieth century thinking about time.[9] The contrasting notion of time conceived as continuous, as flow, as seamless, is something that tends to derive from the agrarian past (cyclically flowing time) and the electrical age (telegraph, telephone, television). It, too, makes a claim for the modern, not only technologically, but in the context of the international time treaties that were signed at the beginning of the twentieth century, or in relation to processes like globalization and simultaneity and indeed, the synchronicity associated with our increasingly computer-mediated present.[10] Like fragmented time, continuous time is both capable of variations (although in place of mechanically speeding up or slowing down, continuous time can be internal, subjective and highly variable) and it is capable of being uniform (as defining "nowness", an external stream without variation).

These two notions are the ends of a spectrum and, as I have suggested above, have long histories that we can trace back to the ontological systems of several pre-Socratic philosophers. Among them, Parmenides of Elea, the champion of a radical notion of "nowness", held that true being was absolutely continuous, homogenous, eternal, imperishable, motionless, and unfragmented, a state of unity with no past and no future. Although he acknowledged that things in the world appear to change, Parmenides nonetheless denied the reality of such appearances. To him, "real being" meant static presence, and notions of "becoming" or "time", were not real because they implied that "something is becoming which it is not." (We owe the rightly famous "paradoxes" to his younger friend and student Zeno, who wanted to show that plurality was unreal and movement impossible.) Atomists like Democritus stood at the other end of the spectrum. They conceived of the universe as fragmented into the "atoms" we are so familiar with nowadays, and for the first time introduced the concept of empty space. They argued that although we perceive a stable world and have a sense of continuity, the world's true nature is fragmentary with the ongoing recombinations of the invisible atoms constituting real change. The Atomists, however, fused both flux and stability claiming that while the world of stable appearances was an illusion, the atoms themselves were considered "eternal, changeless and indestructible."

If they could, the Atomists, for whom stable particles (for atoms, read frames) combine to produce flux, masking the reality of fragmentation with the appearance of continuity, might see film as conforming to their world view. The idea of "stop motion and the fragmentation of time" would seem to address the reality beneath the surface of things, extending the ontological claims of the Atomists into the realm of time. Parmenides and his disciples, if they were able, might lay claim to the televisual with equally good reason, taking the view that both the viewer and the world viewed inhabit the same moment, the same "now", the same unity. The medium simply extends our access to the unity we inhabit.

A Room With a View

Although these two traditions of understanding time have long histories, the situation is somewhat more complicated when we look to historical embodiments – especially those most relevant to the media under discussion. Consider the camera obscura, one of our oldest image technologies and one that has been used both as a means of fixing the world viewed, and as a means of rendering the moving, three-dimensional world

onto a two-dimensional surface while maintaining its movement. It has been used as a tool to trace elements of the non-moving world (architecture, or the sitter for a portrait) and as a means of entertainment and spectacle (watching the passing world from an unobserved perspective). Its long history as a metaphor for vision and consciousness generally, its use as a conceptual model for photography and film, and its specific application as a tool for painting, suggest the term's range of meanings and its centrality to our culture.

Just as importantly, the camera obscura is encrusted with five centuries of historical (and ideological) interpretations, themselves rooted in various philosophical systems. The variety of interpretations over time, depending on the context and critic, has produced complex set of possibilities.[11] Because the implications of the camera obscura are so central to the ideological underpinnings of scopic culture, they are worth situating (even if my choice of interpretations is ultimately as arbitrary as any other). Although the camera obscura's history goes back at least to Aristotle, Della Porta's 1558 treatise developed the concept fully and has remained an important reference point in subsequent thinking about the device. For Della Porta, the apparatus embodied the Renaissance concern for coherence, similitude, and the fixing of the world through resemblance. Just as Alberti's rules of perspective fixed the dynamic distance between subject and object, the camera obscura represented and defined the viewer's relationship to the world viewed. The Enlightenment, by contrast, read the camera obscura in much the same manner as it read nature: as a machine with rules and logic. What was seen was of secondary importance to the rules of seeing, the logic of vision. The Cartesian suspicion of sensory input undermined the world as apprehended by vision and opened the way for its apprehension by reason. (The tradition of Spinoza and Leibniz, both lens makers, would obviously give this idea a new twist.) Today, by contrast, we are more concerned with a kind of ideological polarization: on one hand the camera obscura and its successors can be seen to represent a nineteenth century narrative of representational progress (our vision machines just keep getting better and better); and on the other hand they can be seen as an enduring apparatus of social and political power, surveillance, and control[12] (Fig. 4).

Several aspects of these various interpretive schemes remain largely constant: the camera obscura (and the representation system it is bound up in) can be seen as defining subject-object relations. More specifically, the camera obscura confines and isolates its subject, effacing the viewer, while at the same time physically reinforcing his or her centrality. But such historic interpretations have largely been articulated within the confines of visual culture, leaving unquestioned the temporal aspects of the camera obscura, and rendering it a room with an unproblematized

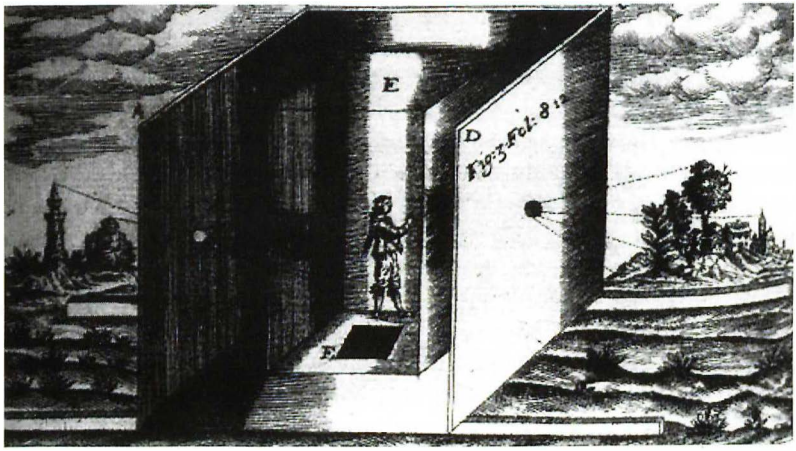


Figure 4: One of the various models of the camera obscura.

view. Indeed, the absence of temporality as an element in the discussion of how the camera obscura represents is striking. Just as with the historically encrusted meanings of visual culture, historically layered understandings of temporality selectively accrete to the interpretation of the camera obscura, giving it complexity. The Renaissance notion of time as a strictly defined system of relations, the Enlightenment concern with the *principles* of temporality, the nineteenth century's teleologically-driven notion of a continuum organized around progressive temporality, and indeed, our own highly relativistic and synchronous notions of time – all these conceptions of time bear fundamentally on the interpretation of the camera obscura.

Our thinking about the camera obscura has tended to avoid the temporal, with the result that one can as easily assert the device's appropriateness for the media of photography and film as for television. Yet it is clear that media defined around temporal disruptions and discontinuities such as the storage-based media of film and photography embrace the camera obscura only in a spatial sense while a medium such as television, by contrast, embraces the camera obscura's temporality as well as its spatiality. The difference is critical: the spatial dimension is largely concerned with representing a particular order; while the temporal is actively involved in the process of ordering.

This distinction, complicated as it is by the shifting field of historical interpretation, might be teased out by looking at related developments in the panopticon, the panorama, and the panoramic motion picture. To quickly recapitulate, the camera obscura has three main features: The viewing subject is in a fixed location, hidden from the world; the viewer's

relation to the world is spatially contiguous and temporally simultaneous; and the viewing subject is at the center of the world viewed.

These three criteria are also met by the panopticon, Jeremy Bentham's monument to the Enlightenment. But the panopticon has given rise to a more specific range of interpretive characteristics: The world viewed is architecturally circumscribed (the panopticon's walls); its agenda is determined by a disciplinary logic, thus surveillance and visual control are its dominant modes; consequently, its ideological orientation is entrapping rather than liberating. The stability and duration implicit in its architectural and institutional design are the key criteria for the functionality of the panopticon, since they aid in the project of observing and controlling the ephemeral: human activity. Yet the irony of the panopticon is that despite very real differences in power between the observer and the observed, it is mutually entrapping. This is in large part due to the human agencies locked within the outer walls of the structure: They can look back, fixing the inhabitants of the tower in their gaze. But it is also due to the constrained nature of the authorized and controlling gaze: the central viewing tower is surrounded by an artificial horizon standing between it and the world, or rather, inserting itself as a surrogate world and obliviating the world beyond. Thus, the panopticon differs from the camera obscura not only in terms of functionality, but also in its definition of the world to be viewed.

The panorama also bears consideration. Patented by Robert Barker in 1787 and architecturally similar to the panopticon, it shares several attributes with both Bentham's monument and the camera obscura: The viewing subject is in a fixed location, hidden from the world; his or her relation to the world is spatially contiguous; and he or she is at the center of the world viewed, which, like the panopticon, is architecturally circumscribed.

Like the world of the panopticon, the world of the panorama is artificially circumscribed, blocking visual access to, or substituting for the lived world. Unlike the panopticon, however, the panorama is not a constructed living world. It is, instead, a simulation, an ideal, virtual world, a construction that is frozen in time. Despite their architectural similarities, Bentham's contrived theater gives way to Barker's equally contrived painting, with the concomitant differences these two spectacles entail.

Significantly, if one looks to Barker's 1787 patents for the panorama, one realizes that his emphasis was on the act of seeing and not, as we often tend to assume, on the object seen. Barker's patent insisted upon "making the viewer feel as if really on the spot," and to that end, he took great pains to define the panorama's framing and masking devices. Barker's description suggests something very much like our contemporary notion of immersion, and suggests as well André Bazin's distinc-

tion between visual realism and perceptual realism (Barker would most likely have advocated the latter rather than the former). As we know today from some of the amusements in London's Trocadero or Los Angeles' Disneyland, or, looking back, from George Hale's chain of cinemas in the first decade of the twentieth century (Hales' Tours of the World), the correct perceptual cues are capable of evoking the experience of "being there" even in the face of less than realistic graphics. As Barker put it, the panorama was "AN IMPROVEMENT ON (sic) painting, Which relieves that sublime Art from a Restraint it has ever labored under."[13]

The panorama thus worked its magic of simulation by relying primarily on framing strategies and only secondarily on painted imagery. Of course the painted (or photographed) subject matter of the panorama, static and more or less adhering to realist conventions, could be compelling in its own right, but the medium's power resided in the combined effect. This contrasts sharply with the camera obscura where the effect stemmed from the process of representation, with the external world taking flattened and inverted form in the darkened room. The translation from lived reality to reflected image occurred instantly, and the realism of the representation served as a benchmark of mimesis. If we compare the stasis and temporal asynchronicity of the panorama's graphics as well as its ability to simulate "being there" to the camera obscura's connection with real time and its graphic reflection of the lived world, we might be reminded of the differences between film and television. Here I would argue that on the one hand, early expectations regarding moving image systems can be accounted for in part by reference to the televisual, which fulfils the camera obscura's spatial and temporal claims. On the other hand, the motion picture panorama, by title the single largest category of films copyrighted in the United States between 1896 and 1912,[14] can be seen as an appropriate inheritor of the panorama's claims, and their emphasis upon the act of seeing rather than upon the simulated reality seen. As I have said, these issues are complicated because of the shifting fields of cultural meaning, and because of the often unpredictable activation of historically embedded interpretations. Nevertheless, cultural space remains a highly determining force, and if we consider the context into which film was born and particularly late nineteenth century thinking about duration and time, the *sine qua non* of a moving image medium, we can raise some interesting questions about the perception of moving pictures.

Late in the nineteenth century, ideas and apparatuses for moving image media took form in the midst of a relatively widespread reconsideration of the nature and structure of time. Some ideas about the nature of time seemed apparent in the attributes of certain technologies such as the instantaneity of the telephone versus the seriality of long distance tele-

graphs where "repeaters" were necessary. Some ideas were institutionally embedded such as the establishment of railroad time in distinction from local time or the mobilization of international political support for universal time and time treaties. And some ideas about the nature of time could be seen in fields ranging from physics (Mach and Minkowski's work with the space-time continuum and Einstein's theories of relativity) to philosophy (Bergson's description of intuitive time and Husserl's discussion of phenomenal time). These latter, more elaborated and less applied ideas about time in particular broke from the older objectivist, mechanized idea of time.

Implications?

The cultural moment at the end of the nineteenth and beginning of the twentieth centuries is widely (and I think appropriately) considered to mark a paradigm shift. The question is how to read the project of fragmentation, of atomizing motion and with it time. There is no question but that certain filmmakers self-consciously embraced the modernist project and made the most of the cinematic means at their disposal, celebrating the relativistic and flexible nature of time by fragmenting motion. But what of the televisual alternative, deeply connected as it was with the ideas of time identified with the telephone? What of the ideas of simultaneity, liveness, and flow as opposed to the mechanical disassembly and reconstitution of time represented by film? Most discussions of the horizon of expectations which greeted the film medium do not include such elements as extensiveness with the lived world and the "now" of the viewing process. As I have tried to show, photography can by no means be assumed to be the sole pre-condition for a moving image medium, and if we go so far as to drop it as a necessary and defining condition, we might begin to ask very different questions about the cultural space film entered. For example, what if the film medium had in fact entered a space prepared for television?

We all know the apocryphal tale of the Lumière effect, with viewers running for cover from the oncoming train. What is curious is the longevity of that story for nearly a decade after that first Paris screening.[15] Might we not read this persistent tale as evidence of the motion picture industry's attempt to situate its products within a discourse of liveness? Might we not see it as proof of the audience's expectation of images that were co-extensive with the lived world? Such readings may be more appropriate than the more familiar attribution of alleged audience shock to the new heights in visual realism achieved by the film medium, or the

explanation that certain naïve audiences could not distinguish between movement and presence.

I have already suggested that the importance of the disproportionately large number of filmed panoramas echoes the relevance of the architectural panorama: both replicated the live viewing experience of the panopticon and camera obscura. As noted, the resemblance resides in *how* these filmed images were constructed, and in particular, the use of minimal editing to create the effect of a space-time continuum. Perhaps the best example of this strategy (one that can be seen in a computer-enhanced version in some contemporary amusement centers) is Hale's Tours, in which elaborate framing strategies underscored the desire to construct a space that seems contiguous (and possibly a time that is simultaneous) with the viewer's.

As we begin to do more research in the area of early cinema, it becomes clear that the signifying practices – particularly with regard to editing – operating in non-fiction differed from those deployed in fiction films. Non-fiction films seemed generally to have resisted the sorts of editorial fragmentation that characterized their fictional counterparts – a tendency that became more evident as the medium developed. The Georges Demenÿ films screened during the conference, particularly the extended shots of waves pounding the shore, could easily have been read in their time as live; the films' arrangements of time and space simulated a televisual viewing experience in the same manner that the panorama simulated the experience of the panopticon. We might, too, consider certain terminological markers that appear in the early years of the film medium: the dominance of the *actualité,* a term loaded with meanings, one of which is temporal; or American Mutoscope and Biograph's 68 mm *Living Postcards;* or the transition, circa 1903, from the *actualité* to "canned" drama that declares the shift from the seemingly live to the emphatically stored (not to mention the insistence on Greek and Latin invocations of liveness – Bioscope, Vitagraph, *lebende Bilder,* etc.). Might such nomenclature be understood as claims to the quality of liveness that I have argued exists in the thinking about moving images in the pre-cinematic era? [16]

Finally, what of the ideological implications of the differences between one apparatus and the other, one form of spectator and the other, one mode of viewing and the other? As I have tried to suggest in my analysis of the differences in the historically inscribed interpretations that affect our understanding of the camera obscura, the panopticon, and the panorama, these implications are situated in specific interpretive regimes. They selectively accrete and are activated in sometimes unpredictable ways. What then are we to make of the very different relation between the viewer and the world offered by, on one hand, the non-photographic, live, continuous televisual and on the other, the photographic, stored, and disconti-

nuous filmic? Understanding the horizon of expectations that greeted early film is as important in answering such questions as is understanding the moment of cultural inscription.

As I have tried to suggest by looking back to the sixteenth century and the camera obscura, there is much that can be said about the persistence of non-photographic moving image technologies. I have limited myself to exploring the implications of this tradition as a way of rethinking the intermedial space the early film medium inhabited. But one might also consider its ongoing role in the *pas de deux* of media differentiation and identity. Television-telephone systems of the mid 1930s, various plans (some acted upon) for telepresence systems from the 1920s-1940s, and today's web-cams – they might all be considered as elements in this ongoing tradition. By reframing the questions we put to the past, we will be better able to consider the ongoing transformations in media technology, identity, and cultural practice.

NOTES

[1] I wish to thank Frans Jersen for sharing his thoughts on time and Marta Braun for her significant improvements to this manuscript. As well, I would like to thank the participants of the media history seminar at Utrecht University for their comments on the text.

[2] Perhaps "perverse" is a better descriptor, since the first article I published on this idea appeared in 1994 in a publication that was celebrating cinema's centenary. See W. Uricchio, "Cinema als omweg: Een nieuwe kijk op de geschiedenis van het bewegende beeld," *Skrien,* nº 199, 1994, pp. 54-57; for a more elaborated version of the argument, see my "Technologies of Time," *Allegories of Communication: Intermedial Concerns from Cinema to the Digital,* ed. J. Olsson, Berkeley, University of California Press, 2002.

[3] George du Maurier, "Edison's Telephonoscope (Transmits Light as Well as Sound)", *Punch's Almanack for 1879,* 9 December 1878.

[4] Albert Robida, *Le Vingtième siècle,* Paris, G. Decaux, 1883.

[5] For a detailed listing of, respectively, early television and moving image technologies, see Albert Abramson, *The History of Television, 1880-1941,* London, McFarland, 1987; Herman Hecht, *Pre-Cinema History: An Encyclopaedia and Annotated Bibliography of the Moving Image Before 1896,* London, BFI-Bowker-Saur, 1993; George Shires, *Early Television: A Bibliographic Guide to 1940,* London, Garland Publishing, Inc., 1997.

[6] Stephen Herbert, *Industry, Liberty, and a Vision: Wordsworth Donisthorpe's Kinesigraph,* London, The Projection Box, 1998.

[7] Stephen Kern, *The Culture of Time and Space, 1880-1918,* Cambridge, Harvard University Press, 1983.

[8] In the West, we can distinguish between two broad approaches to the definition of time: one approach defines time as a structure, as either fragmented or as flow; the other defines time as an experience, as past or present. For discussion about the pre-television era, I have collapsed the two. The photographic character of film necessarily implies a temporal state of "pastness"; while, for the purposes of my argument, I am tak-

ing the televisual to be "present" (ignoring the recorded nature of much contemporary television). This distinction is a crucial one with important implications for a larger discussion of the media.

[9] Donald Lowe, *History of Bourgeois Perception,* Chicago, University of Chicago Press, 1983.

[10] Manuel Castells, for example, defines globalization in temporal rather than spatial terms, paying particular attention to the near-simultaneity of information circulation. See Manuel Castells, *The Rise of the Network Society,* Cambridge, Blackwell, 1996.

[11] Jonathan Crary, for one, has selected from among these possibilities for his reading in his *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century,* Cambridge, MIT Press, 1990, but clearly many other readings of the camera obscura's implications are possible as well.

[12] Foucault is here exemplary. See pp. 195-228 of his *Discipline and Punish: The Birth of the Prison,* New York, Vintage Books, 1979.

[13] Robert Barker, Edinburg Evening Courant, 29 December 1787, cited in B. Wilcox, "Unlimiting the Bounds of Painting," in Ralph Hyde, *Panoramania! The Art and Entertainment of the "All-Embracing" View,* London, Trefoil Publications/Barbican Art Gallery, 1988, p. 21.

[14] W. Uricchio, "Panoramic Visions: stasis, movement, and the redefinition of the panorama", *La nascita dei generi cinematografici/The Birth of Film Genres,* ed. L. Quaresima, A. Raengo and L. Vichi, Udine, Forum, 1999, pp. 125-133.

[15] See Stephen Bottomore's, *I Want to See This Annie Mattygraph: A Cartoon History of the Coming of the Movies,* Gemona, Le Giornate del Cinema Muto, 1995, especially pp. 44-53, which include graphic reference to such confusion as late as 1913.

[16] For more on this argument, see W. Uricchio "Aktualitäten als Bilder der Zeit," *KINtop* 6, 1997, pp. 43-50.