Cinema and the Code

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What are the implications of digital imaging for the evolution of cinematic language? Since 1986, Peter Weibel, Steina and Woody Vasulka and I have been meeting to discuss that question [1]. We thought our talks might become a book, whose subject Weibel conceived as "the evolution of the image through the digital image". What follows is an outline of our conversations, assembled for this publication from 200 pages of transcript. It is in every sense a first draft, a working paper. We are quite aware of the problematic nature of our discourse, especially in the cursory form presented here. Every conclusion is vulnerable to criticism, which we welcome. We are certain of only one thing, that these questions are important and need to be explored.

The subject of 'digital imaging', we agree, exists in the context of both video and the computer (different only in the source of the image and the possibility of real time operation) and covers the generic areas of image processing, image synthesis, and writing or organizing digital code in a procedural or linguistic fashion [2]. But in every case when we refer to the phenomenology of the moving image, we call it cinema. For us it is important to separate cinema from its medium, just as we separate music from particular instruments. Cinema is the art of organizing a flow of audiovisual events in time; it is an event-stream, like music [3]. There are at least four media through which we can practice cinema—film, video, holography and structured digital code—just as there are many instruments through which we can practice music. Of course each medium has distinct properties and contributes differently to the theory of cinema, each expands our knowledge of what cinema can be and do. Each new medium modifies and extends the linguistic possibilities of the moving image, subsuming the syntaxes of previous media without negating them.

Thus, the basic phenomenology of the moving image—what Vasulka calls "the performance of the image on the surface of the screen"—remains historically continuous across all media. Digital code, for example, has radically altered the epistemology and ontology of the moving image but has not fundamentally changed its phenomenology. There are no digital images that have not been prefigured in painting, film and video. With the code we can only summarize them, elaborate and unfold them or exercise modalities. Vasulka calls the code a variation machine. There are no new classes of images, there are only new variations and new epistemological and ontological conditions for generating and witnessing those variations. Each new medium of the future, says Vasulka, can only "play host to the phenomenology of the moving image", which will evolve through that medium to the next, accumulating the language of each.

Weibel puts it this way: a medium is "a corpus of aesthetic strategies" inherited from previous media. In the 1920s mathematicians attacked the problem of foundations. What was pure logic? What was an axiom? Today the answers to those questions are implemented in the computer. Logical concepts have become instrumental, they have become parts of machines. And any machine element, says Weibel, is nothing but a physical implementation of a formal device. It implements mental strategies into something physical. (This is what Buckminster Fuller meant when he defined technology as "instrumented or documented intellect"). Similarly, aesthetic strategies invented 100 years ago in photography and cinema—scaling, perspective, positive/negative reversal, wipes, mattes—have now become machine elements whose operations are trivially invoked through the preset buttons. It is a question of primitives. The code is a metamedium: through it, high-level aesthetic constructs from previous media become the primitives of the new medium. This influences which aesthetic strategies will be emphasized. When a strategy that was possible but difficult in film becomes a preset button in video or a command in computer graphics, it tends to be used more frequently. But that does not make it more meaningful. The challenge is to turn 'effects' into expressions, into syntactical units of meaning.

This raises the question, How has the corpus of aesthetic strategies inherited in a medium like photography or film transferred over to electronic media and especially to the code? Things are possible in the code that were not possible or at least not easy, in film and video. Only by comparing formal devices developed in one medium to other devices developed in other media can we arrive at criteria for evaluating artistic achievement. Have the syntactical and linguistic possibilities of the digital image been identified and elaborated in practice? We think not—at least, not very often. We rarely find them in the work that is otherwise admired in the name of the medium. People praise a particular work of 'video' or of 'computer art', and yet we find in this work no definitory elements of video or of the code. It may be great cinema but it is not great *electronic* cinema. We are not arguing for exclusivity or essence. We are not trying to be the Clement Greenberg of the code. The phenome-

fundamental challenge to the metonymic nature of cinematic language. He invokes the name of Roman Jakobson, who argues that there are only two fundamental operations in language: metaphor and metonymy. And the language of cinema is not metaphoric, it is metonymic. It is the language of the part for the whole. All cinematic images are contingent. The frame, said Jakobson, is always part of an unseen whole. At its fundamental syntactic level—the level of cutting, of editing, of bringing spaces together—the filmic language game is metonymic. In the service of psychological realism, conventional editing reconstructs 'real' time and 'real' space, following logical causal chains by metonymic association. Experiments like *Last Year at Marienbad* were attempts to transcend that limitation within psychological narrative. But in the electronic image there is no need to make a *Marienbad*, because it is clear that we no longer have that constancy of time and space. Once an image-object is set against a reference, the metonymic tension is lost. Objectifying the image within the frame puts it in a different time zone. Metonymy becomes problematic. On the one hand, such constructs are not metonymic because the space they occupy is not 'natural'. The image-object is not part of the whole; it is no longer contingent. But it is not metaphoric either. It is something new. We do not know what it is. It might still function metonymically, but in a different way. This is an important area that is wide open for aesthetic exploration.

The second level of the image as object is achieved through digital image synthesis. Here, because it is a three-dimensional database, we can control not only the location of the image-object within the frame but also its perspective, its angle of view, its geometry. As a result, the synthesized image becomes truly an object, the witness becomes a 'user', and the relation between them becomes not observation but interaction. Jean-Louis Baudry argues that, in the cinema of psychological realism, the primary identification of the spectator is not with the characters but with the camera itself [5]. But in interactive image synthesis, the spectator *is* the camera. Since it is not separate from the scene it surveys, the virtual camera is neither a voyeur nor an instrument of surveillance. "It is a point of view that is active *within* the scene", writes Catherine Richards. "Not only can the camera (the user) direct its own looking, it can be sensed, responded to, and represented in the scene: it sees and is seen" [6].

The third level of the objectification of the image is realized through three-dimensional display. Whether through holography or binocular (stereoptic) technology, cinema is moving from the two-dimensional image on a screen to the three-dimensional object in space. Today cinema represents reality; tomorrow it will *be* reality. Already with stereoptic technology the image becomes an object. And in Scott Fisher's virtual environment project of the U.S. National Aeronautics and Space Administration (NASA) (combining a three-dimensional database with stereo vision in a wraparound head-mounted display), cinematic space becomes a place to live. An unframed image is not an image, Vasulka points out, it is an object in space: "It forces you to deal with air." It is no longer a representation but the thing itself. Vasulka notes that different understandings of reality and truth are implied by the representational image and by an object in space, no matter how insubstantial that object may be. Three-space cinema, he suggests, is more like theatre. In two-space cinema there is truth but no reality. In theatre there is reality but no truth.

References and Notes

1. Peter Weibel is a videomaker, mathematician, art historian, writer and professor of art and electronic media in Austria and the U.S. Steina and Woody Vasulka are internationally known video artists who founded The Kitchen in New York City in 1970 as one of the world's first presentation centers for electronic art. Gene Youngblood is author of *Expanded Cinema* (1970), the first book about video as an art medium.

2. Both real-time video machines and computers operate on the same structure of digital code. ADO, Quantel and Fairlight are digital computers. The only difference is that they take their 'model' from camera input and they operate in real time. With the exception of extremely fast computers, most digital image synthesis, or 'computer graphics', is not done in real time. Other than this we make no distinction between [illegible] except in reference to the source of [illegible] organization of the image—one through camera input, the other through algorithms. [illegible] regard the process of writing or structuring the code as part of the digital-imaging procedure. It is the craft of digital imaging in computer graphics. You do not 'write the image' in video.

3. My colleagues have found the concept of the 'event-stream' problematic. Vasulka defines it as "every scheduled change". He points out that there is always an invisible technological level to every perceived event, like the event of line-forming in video, or computations and logical operations in image synthesis. The key is to realize that the event does not have to be consciously perceived. In music, for example, a listener would be incapable of naming each sonic event, but music is nevertheless a system of parallel events and [illegible]

4. Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction", in *Illuminations* (New York, 1978) p. 237.

5. Jean-Louis Baudry, "Ideological Effects of the Basic Cinematographic Apparatus", *Film Quarterly* 28, No. 2 (Winter 1974–1975). Quoted in Christian Metz, "History/Discourse: A Note on Two Voyeurisms", in *Theories of Authorship*, John Caughie, ed. (London, 1981) p. 231.

6. Catherine Richards, "Virtual Worlds, Digital Images", in the catalog of the 1987 American Film Institute Video Festival (Los Angeles, CA, 1987).

impossible to distinguish every voice in a musical composition. One is disturbed by this only if one is unfamiliar with it. Once one learns to read it, the dense text is a pleasure. Digital code offers possibilities of image-overlay whose linguistic potential we have not begun to explore.

The second possibility is more familiar: framed parallel event-streams, such as split screens in film (optical printing) or floating imageplanes in video, done with digital effects devices such as ADO or Quantel. But there is also the possibility of *unframed* parallel events occupying different areas of a single image. This can best be seen in the work of the Vasulkas, for example, where pointillist textures move independently in separate areas of the frame. Different zones of the image are activated in different ways in parallel. The Vasulkas accomplish this through digital image processing. But image synthesis, through a variation on metamorphosis, would provide unlimited possibilities for unframed but separate parallel event-streams in a single frame.

Below, in a discussion of the image as object, I shall have more to say about parallel event-streams. Meanwhile, consider that simultaneity enlarges our concept of a cinematic event. Weibel puts it this way: whereas first we had the industry of the moving image, today we have the industry of the accelerated image. If there are three image-planes instead of one, the information conveyed within the overall frame is tripled, and, furthermore, each succeeding image destroys the meaning of the previous one. The information is accelerated so much in perspective and in all other ways that the value of 'the image' is replaced by the value of the image-gestalt or image-field.

TEMPORAL PERSPECTIVE

"The history of every art form", wrote Walter Benjamin, "shows critical epochs in which a certain art form aspires to effects which could be fully obtained only with a changed technical standard, that is to say, in a new art form" [4]. Weibel pursues this logic in reverse, working backward from the digital image to find desire for its powers in art history. He begins by noting that Renaissance perspective was always at eye level with one point of view and one vanishing point. By 1850,, photographers were climbing onto Parisian rooftops and shooting down into streets. Twenty years later, Odilon Redon painted a balloon-suspended eye moving up into the sun. Perspective as no longer bound to a static point of view. It had become free-floating. In the same period, the German Romantic painter Kaspar David Friedrich painted mountain shadows falling at an angle different (that is, displaced in time) from that of the impinging sunlight. Other examples are found in the work of El Lissitsky and the Cubo-Futurist movement. Painting, influenced by photography and cinema, introduced multiple points of view and implied time.

And what did cinema do with perspective? Not much. Bound to psychological realism, it exploited it only spatially, mainly through deep focus (Eisenstein, Welles, Renoir), never temporally. Only in experimental cinema was temporal perspective explored in any serious way at all—the outstanding example being the work of Michael Snow, such as *La Region Centrale* and *Back and Forth*. But with the advent of the code, the emphasis on perspective returns. Moving-image art can now embrace it in an emphatic way. When the image is a three-dimensional database, perspective becomes a temporal as well as spatial phenomenon. It is a strategy that is intrinsic to the code. Painters, photographers and filmmakers could not realize the full potential of this desire. But now we can unfold and elaborate that which could only be indicated in earlier media.

Vasulka notes that, if we remove the two cinematic vectors from earth to space and establish the principle of a point in space, we arrive at two possibilities: first, cinema looks from one point to infinity in a spherical point of view. That is one vector, we shall say. The other is the opposite: one looks from each point in space towards a single point. If all these points are in motion around one point, that is the space in which ideal cinema operates. But as long as we are talking about psychological realism we will be bound to an eye-level cinema.

THE IMAGE AS OBJECT

There are three technologies through which the image can become an object: image processing, image synthesis, and three-dimensional display—either binocular (stereoptic) or holographic. The code is responsible for the first two and may be partially involved in the third. This is another aspect of parallel event-streams. We recognize cinema as frame-bound and frame-unbound. Mechanical cinema is characterized primarily by its reliance on the frame. It cannot leave the frame unless a special effort is made through optical printing. But with code it becomes a trivial matter to remove the image from the frame and treat it as an object, an image-plane, because those tools have no capacity to deal with the geometry of the image itself: they deal only with its location or position (its 'address') within the larger frame. The use of framed parallel events points to new narrative possibilities, new semiotic strategies—for example, the possibility of a previous or future event appearing spatially behind or in front of a current event within the same frame. There is always a pending image. Editing can be avoided entirely—as Vasulka did in his 1987 work *Art of Memory*. He points out that, through hierarchies of image planes in particular arrangements 'in a mental space', future and past tenses may be suggested. As already mentioned in the discussion of parallel event-streams, conventional film language is rather inarticulate in this respect. There is no temporal eloquence in film. But digital video suggests the possibility of establishing one image-plane as 'present' with other time-frames visible simultaneously within the frame. This would extend the possibility of transfiguration (metamorphosis) into a narrative space composed of layers of time, either as moving or still images. Ed Emshwiller's *Sunstone* was one of the first works to explore these possibilities. In it the image becomes object, and it has both framed and unframed parallel event-streams.

When image becomes object in a stream of parallel events, the realm of psychological realism or photographic truth is abandoned. The frame-bound photographic image brings us truth. But three image-planes within a frame lose what Vasulka calls "the aura of truth". We detach ourselves from them psychologically. Will it be possible to construct a psychological space in a language of frame-unbound parallel event-streams?

For Weibel, all this raises a

nology of the moving image remains constant across all media, but each new medium brings about a shift of emphasis or accent. Through the code, we can unfold the potential of formal strategies that were possible but limited in previous media, thereby expanding the richness of cinematic language.

Vasulka asks, "Who creates the language of a medium?" Weibel responds by quoting Heidegger: "Man is but a guest in the house of language." Vasulka agrees. All possibilities of a system, he says, are contained within that system. We are not free to invent the language of film, video or computer. The language already exists in the system. Our task is to discover it, identify it, draw it out and name it, put a nomenclature on it. Vasulka has built his machines in order to discover 'the language' in them, which could be found only through dialogue with the machines. He points out that this is not unique to electronic cinema. Film language also arose from a similar systemic understanding. As a syntactic device, the cut, the edit, is machine-bound. It is the only way to splice film. The most important figures in the history of film are those who elaborated its syntactic or linguistic potential. This is our criterion for artistic achievement in the new medium: to what extent does the artist articulate and develop the formal possibilities of the system as syntactical or linguistic elements? To what extent does the artist transform effects into expressions?

It is a question not only of the evolution of cinematic language, but of human perception itself. Human vision, Weibel points out, has always been 'machine-assisted'. The invention of perspective, for example, was machine-dependent. It was derived from optical instruments. Dürer's boxes were in this sense 'machines'. They implemented physically what then became formal strategies. With the help of this machine we could invent perspective. (Weibel thinks this curious. Why did it take so long?) Similarly, Vermeer, under the influence of Spinoza and the science of optics in the seventeenth century, created paintings that were not initially seen as poetic. They were regarded more as scientific research. (In the nineteenth century, Proust, influenced by photography, 'rediscovered' Vermeer, now regarded as a poet. The computer is to the artist of today as the lens was to Vermeer.) The Impressionists, too, were following theories, not subjective experience. Impressionism was based on color theory: three different colors produce a fourth impression. An optical theory of color, says Weibel, is also a machine, a mental machine, like a Turing machine. Thus we have substantial evidence that the evolution of vision is dependent on machines, either mental or physical. It has come to the point that it is no longer possible to suppress the machine part of it: first there was the camera, now the computer. This is significant, Weibel thinks, because art always tries to suppress the influence of the machine element in the work itself. It is not art if the technology is too apparent. But the issue here is not art, it is language and perception. They co-evolve only to the extent that the syntactic possibilities of technological systems are made the subject of aesthetic inquiry.

The following formal possibilities of digital imaging are available for articulation as syntactic elements or linguistic primitives: (1) image transformation, (2) parallel event-streams, (3) temporal perspective and (4) the image as object.

IMAGE TRANSFORMATION

If mechanical cinema is the art of transition, electronic cinema is the art of transformation. Film grammar is based on transitions between fully formed photographic objects called frames. It is done primarily through that collision of frames called the cut, but also through wipes and dissolves. In electronic cinema the frame is not an object but a time segment of a continuous signal. This makes possible a syntax based on transformation, not transition. Analog image processing is one vehicle of this particular art—for example, scan processors. But it becomes even more significant in digital image synthesis, where the image is a database. One can begin to imagine a movie composed of thousands of scenes with no cuts, wipes or dissolves, each image metamorphosing into the next.

A cut is a cut, but a transforming or metamorphosing operation is open-ended. There are infinite possibilities, each with unlimited emotional and psychological consequences. Metamorphosis is not unique to digital imaging; it is a familiar strategy in hand-drawn animation. What is unique is the special case of *photoreal* metamorphosis. It is one thing for a line drawing or fantasy painting to metamorphose, quite another for a photographically 'real' object to do so. This is theoretically possible in mechanical cinema and has been prefigured (but never fully realized) in hand-drawn animation, where it is so difficult and time consuming that it is, for all practical purposes, impossible. It is possible digitally, because the code allows us to combine the subjectivity of painting, the objectivity of photography and the gravity-free motion of hand-drawn animation.

Steina points out that there are two kinds of transitions based on the cut, and these require different kinds of metamorphoses. One moves us to a different point of view in the same space/time, the other moves us to a different space and/or time. In flashbacks (cinematic memory), either a matte is used within the frame or the whole frame dissolves. With the code, a part of the frame can metamorphose. This implies an expanded cinematic language of simultaneity.

PARALLEL EVENT-STREAMS

With the arrival of electronic cinema it became apparent that film grammar was limited in what might be called its vocabulary of tenses—for the most part it was 'meanwhile' or 'after'. For example, simultaneous events are traditionally signified through cross-cutting, or what is known as parallel montage. But, Weibel notes, there was never a formal distinction between a cut to a different position in space/time (say, between people in conversation) and a cut between different spaces or time. The distinction has always been logical or inferential (as in parallel montage), never formal. Digital code offers formal solutions to the 'tense' limitations of mechanical cinema. Past, present and future can be spoken in the same frame at once.

There are at least three possibilities: superimpostion (overlay), or simultaneous but spatially separate event-streams that are either framed or unframed. Superimposition has been explored extensively in experimental film, notably by Stan Brakhage. His work is the closest cinema has come to the Joycean text. In such work it is not always possible to identify consciously each image-stream, just as it is often