

CAMERA MOVEMENT AND CINEMATIC SPACE

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Camera movement in the cinema is one of the most difficult areas for critical analysis. Seen as an alternative to montage, or as a stylistic fingerprint, or the occasion for reverie, camera movement has usually been considered too elusive to be analyzable. This essay is an attempt to examine more closely the functions of camera movement in cinematic representation. While several theoretical frames of reference (the semiological, the psychoanalytic) could help us in this task, I shall try to develop another approach, a perceptual approach, because of my conviction that a recognition of the perceptual features of cinema should be part of any thoroughgoing attempt to understand filmic experience.

Let me suggest the value of this approach with reference to a specific issue. It is a commonplace of contemporary film theory that certain cinematic processes seek systematically to station the viewer as subject before an idealized, objectified representation. This is a useful hypothesis, but too seldom do theorists analyze the perceptual bases of that subjective stationing. If we consider, for example, perceived depth on the screen, it is certain that pictorial codes function to help efface the image surface and push us toward reading the picture as an imaginary space, a scenography; and it may be fruitful to think of our relation to that scenography as being one whereby, as Baudry puts it, "the imaginary order fulfills its particular function of occultation, of filling the gap, the split, the subject on the order of the signifier." But we should also recognize that the traditional conditions for viewing a film already, at the perceptual level, reduce the number of cues which might help us to locate the picture as a flat surface. For instance, *interposition*, the possibility that the presence of other viewers besides and in front of us might let us see the screen as only one surface among a series of surfaces, is minimized by some very habitual theatrical practices — staggered seating and the correct viewing angle so that nothing blocks our view of the screen. Binocular disparity (the fact that the eyes see two slightly different fields and get slightly different information from each field) is ruled out by the "ideal viewing distance," which seeks to minimize the difference between the two eyes view onto the screen. The fixity of the screen itself eliminates the need for the viewer to make efforts of accommodation, those muscular movements that are necessary to focus the eye. Finally, we do not inspect the image on the screen as we might a picture as we stroll through a gallery. Any movement parallax on the part of the spectator is minimized by the fixity of the seat and the limitations put on the spectator's head movements. In sum, then, the viewing situation filters out many cues which would call our attention to the screen as a surface.

1 Jean-Louis Baudry, "Ideological Effects of the Basic Cinematographic Apparatus," *Film Quarterly* XXVIII, 2 (Winter 1974-75), 45.

Now the above sketch simply sets out some negative conditions for our viewing; a complete analysis would have to consider all the factors of the image and of the viewer's mental processes as well. If I cannot examine all of the perceptual conditions of film-viewing here, still less can I be exhaustive in applying a perceptual analysis to the representational functions of camera movement. Yet we can begin to ask how camera movement asks to be "read" perceptually. Though the temporal and expressive functions of camera movement are extremely important, I shall confine this analysis to some problems of space. What kinds of spatial perception are entailed by camera movement?

Representing space, depicting an absent space, seems fundamental to camera movement as ordinarily used. Like most of our critical concepts in cinema, however, "camera movement" is not derived from a unified critical theory, but rather has issued from a mixture of technical jargon and critical parlance. The very notion "camera" already situates us not before the cinema screen, but in a film studio, in production surroundings which include a mechanism called *a camera*. A profilmic event, this account might go, exists in empirical reality and is filmed by the camera. This event is represented, re-played on the screen. On this account, camera movement simply means that the apparatus which films this event moves while filming this event. The word "pan" then names one kind of movement of the apparatus, "tilt" another, "tracking shot" another. And both the camera's movement and the filmed event are recorded by the camera itself, to be re-presented on the screen.

The advantages of the pro-filmic event account are apparent. The model can be made quite exhaustive. With the aid of spherical geometry, we could plot within a three-dimensional system of coordinates any sort of camera movement in relation to any sort of subject movement. Such a geometrical system would have an advantage over the empirical terminology in revealing deductively many possibilities of camera movements which are seldom used and for which, in fact, we have no names. (What do we call it when the camera spins on its own axis, either horizontally or vertically?) By assuming the empirical existence of an object which can be manipulated in a three-dimensional space, the profilmic event account could yield significant categories. The three-dimensionality implicit in the profilmic event model suggests as well a basis for the orthodox comparison between the camera and the human body. The head may rotate, that is, pan or tilt, or the entire organism may displace itself, may "locomote" by tracking or craning.

Still, the profilmic event model poses difficulties when we apply it to the problem of camera movement. Because this account repeats the problematic dualism between some innocent "real" event and some transformation of that event by the act of filming, the profilmic-event model cannot specify *the perceived screen event* which we identify as camera movement. Camera movement during filming is neither a necessary nor a sufficient condition for the perception of camera movement in the finished film. Some obvious examples would be process work or backdrops unrolling behind people walking on treadmills. Animated film poses a supreme example of this problem: we may see camera movement in an animated cartoon even though the empirical camera has remained absolutely stationary during production. All such screen events use an immobile camera to present enough correct onscreen configurations for us to identify "camera movement". Similarly, the movement of the camera during production does not guarantee that a perceptible camera movement will appear on the screen. Recall how, in the "Lullaby of Broadway" number in *Golddiggers of 1935*, Winnie Shaw's head, a pinpoint of light at the center of the screen, comes swimming out of the

darkness at us. In production, of course, the camera was moved, but on the screen the overriding perceptual fact is that of a face floating out toward us. More elaborately, in Dreyer's film *La Passion de Jeanne d'Arc*, though the camera did move in production, in certain shots figures walk across the room against blank backgrounds and don't seem to be moving; they seem to jog in place. Similar effects occur in the films of Miklos Jancso and Michael Snow. The conclusion is that we need another model for describing camera movement, one that does not rely on a conception of some profilmic event through which, around which, toward which the camera is moved.

There must be perceptual cues which determine a "camera-movement effect" onscreen *regardless of whether the camera moved in production or not*, (since we recognize camera movement without necessarily making any inferences about production circumstances, and since animators have intuitively understood what cues will produce that camera-movement effect). But the cues must be visual ones, (Or in the case of the sound cinema, visual and sonic ones: This essay confines itself to visual cues.) This of course, already limits the range of the cues available for us to sense the camera-movement effect. In our normal movement through the world we operate with a host of cues — kinesthetic cues, bodily movement cues, tactile cues, labyrinthine cues, cues for balance and gravity, as well as visual cues. Special screening conditions, of course, sometimes supply those other cues as well, as in Hale's Tours or Disney World's "Trip to the Moon" ride. But usually cinema screenings omit such desiderata and make visual and sonic cues do duty for all the other kinds. From the standpoint of the history of the concept of representation, this funneling of information onto the visual channel would be another symptom of the Post-Renaissance linkage of sight with truth. Perceptually, however, limited cues can still be powerful. For instance, in ordinary situations, nonvisual cues are utilized during *active* locomotion, when we determine our movement through the world or some movement of our body. But passive locomotion, say, riding on a train or bus, enforces a much greater dependence upon purely visual cues. When we sit in an unmoving train, the sight of a passing train can even mislead us into thinking that we are moving and the other train is stationary. Our dependence on visual cues is more strongly marked in a passive locomotion situation, *the situation most analogous to the cinema spectator's viewing situation*.

Camera movement, I suggest, presents us with a constricted but effective range of visual cues for subjective movement. The primary cue for recognizing the camera movement effect is what psychologists of perception call "monocular movement parallax," a concept first explained by the psychologist Helmholtz. When we walk through a countryside with eyes fixed on the distant horizon, he noted;

". . . objects that are at rest by the wayside . . . appear to glide past us in our field of view in the opposite direction to that in which we are advancing. More distant objects do the same way, only more slowly, while very remote bodies like the stars remain permanent positions in the field of view. . . Evidently, under these circumstances, the apparent angular velocities of objects in the field of view will be inversely proportional to their real distances away; and consequently, safe conclusions can be drawn as to the real distance of the body."²

In more formal terms, for the impression of subject movement to arise, a differential angular velocity must exist between the line of sight to one object and the line of sight to any other object at a different distance and/or angle within the visual field. Mathematical formulas have been constructed to cal-

² Quoted in James J. Gibson, *The Perception of the Visual World* (Cambridge, 1950), 119.

culate and predict such differential velocities. In applying to camera movement, we could on the basis of onscreen evidence state mathematically the conditions for, say, a pan shot; that is, a specific set of differential angular velocities that are obtained among objects moving across the frame. For the camera movement effect to occur, monocular movement parallax must be read from the entire visual field. If only a part or item in the visual field yields that differential angular velocity across time, then camera movement will not be specified — only the movement of that object will be specified. Thus camera movement can be described and analyzed perceptually, as a screen phenomenon. A Gestalt psychologist like Rudolph Arnheim could explain that total displacement of the visual field effected by camera movement by using concepts like dependence, enclosedness, variability, size differences, and so on.⁴ A psychophysicist like James J. Gibson would hold that perceived subject movement is indicated by changes in the rate of displacement of contours in a visual field; Gibson could analyze that flowing optical array on the screen into features of texture gradient, and then the relationships between those features could be specified to give us an analytical description of camera movement.⁵ However different the theoretical frames of reference, camera movement could be described as a system of perceptual relationships.

3 C.H. Graham, "Visual Space Perception," in Clarence H. Graham, ed., *Vision and Visual Perception* (New York, 1965), 51 1-516.

4 See Rudolf Arnheim, *Art and Visual Perception*, second edition (Berkeley, 1972), 394 ff.

5 See Gibson, *Perception, and The Senses Considered as Perceptual Systems* (Boston, 1966), 161.

One of the principal kinds of information that differential angular velocities produce is spatial. I suggested earlier that the conventional viewing situation works to block our perception of the screen as surface. What enters to fill that blocked perception is an extensive system of cues for reading the represented space as possessing depth. Within this system, the moving camera becomes a powerful tool for rendering a static visual array as three-dimensional. A still picture — a photograph, or a painting, or a single frame of film — yields a great number of perceptual cues for the layout of the depicted space — the familiar size of objects, overlap of objects, shadows attached to objects, cast shadows, detail perspective, aerial perspective, linear perspective, color, and others. Experiments have shown, however, that despite such cues a static picture retains a certain fundamental ambiguity about its spatial layout. In 1946, for instance, Adelbert Ames constructed a room which could be viewed only through a peephole, and showed that when a single vantage point forbade the spectators' investigating the object from other positions, a crisscross of lines and planes could be read from that point as a perfectly legible image (a chair, say). But only from that point. This entails that the perceptual configuration "chair" can be produced by an infinite number of possible arrays. As Gombrich puts it, "Any number of objects can be constructed that will result in the identical aspect from the peephole."⁶ Similarly, R.L. Gregory has constructed objects which seem impossible and contradictory when viewed from a single fixed point.⁷ The conclusion has been that any pictured scene may be read as an infinite set of possible three-dimensional shapes. The static image does not specify the physical layout of a depicted space, Now the familiarity of objects and the movement of objects (as in cinema) reduce such ambiguity considerably. But subject movement can virtually eliminate any ambiguity. "In any given configuration," J.J. Gibson writes, "the optical flow [produced when moving from one point to another], the transformation, is specific to that layout of surfaces, and no other."⁸ That is, subject movement gives us a sufficient amount of information to define a particular spatial layout. A moving vantage point supplies a dense stream of information about objects' slants, their edges, their corners, their surfaces, their relations with other objects. Julian Hochberg puts it another way: "When the observer moves, the informational economy of seeing only one spatial arrangement in front of him or her becomes overwhelm-

6 The experiment is described in E.H. Gombrich, *Art and Illusion* (Princeton, 1965), 248 ff.

7 R.L. Gregory, *The Intelligent Eye* (New York, 1970), 37ff.

8 Gibson, *Senses*, 199.

ingly greater than that of any other. In fact, it appears that if he uses all the visual information that is available, there is no way at all of fooling a moving observer once we let him determine his own movements."⁹ So in its most usual employment, the moving camera replaces that free binocular movement parallax which we surrender upon settling into our cinema seats and substitutes a monocular movement parallax that can eliminate an enormous amount of ambiguity about the spatial layout of that scenographic space.

The ability of subjective movement to endow static arrays with depth is usually called the "kinetic depth effect." As camera movement, the kinetic depth effect operates to some degree in panning, tilting, and all other rotational movements around the axis of the camera itself. But the kinetic depth effect achieves its greatest power to define space through the traveling shot. Indeed, directors seem to have intuitively understood how traveling shots can produce the kinetic depth effect. Some of the most celebrated early tracking shots, such as in Pastrone's *Cabiria* and Griffith's *Intolerance*, give volume to otherwise static architectural masses, rendering enormous sets legible as depth rather than as a flat construction. "In dollying," says Alan Dwan, "we find it's a good idea to pass things in order to get the effect of movement. We always noted that if we dollyed past a tree, it became solid and round instead of flat."¹⁰

9 Julian Hochberg, *Perception* (Englewood Cliffs, 1964). 94.

10 Quoted in Peter Bogdanovich, *Alan Dwan* (New York).

No sooner have we eliminated the profilmic model, with the camera as a mechanism coasting through a three-dimensional studio, than we find ourselves confronting set of onscreen cues which install the viewer as a subject moving through a fictive scenographic layout. Monocular movement parallax thus defines not only the space of the image but also the perceptual position of the viewing subject. If only one spatial layout corresponds to the trajectory of the movement, it is also true that only one trajectory is specified by the differential angular velocities of the objects. Thus we can hardly resist reading the camera-movement effect as a persuasive surrogate for our subjective movement through an objective world. Under normal circumstances it is virtually impossible to perceive those screen events as merely a series of expanding, contracting, labile configurations. The cues overwhelmingly supply a compelling experience of moving through space. The charm of the profilmic-event model is that from those plentiful screen cues, the person versed in the ways of cinema can easily extrapolate a dualism of filmed event and a mobile filming mechanism. To use the terms proposed by Stephen Heath, camera movement operates in that zone between the spectator's "look" and the camera's look," perceptual cues serving to identify the two.¹¹

This essay has necessarily limited itself to the perceptual representation of space through camera movement. Obviously the entire question needs more examination. We must study not only space but the temporal and expressive functions of camera movement. Because the camera-movement effect depends upon perceiving differential angular *velocities*, the duration and order of stimuli are also central to its effects. Through time, camera movement can reinforce, modify or shift expectations and hypotheses about the scenographic space. Moreover, because of the predominant anthropomorphism of our conception of camera movement, we need to look at the concept of the "expressive" features of camera movement (what makes a movement languid or portentous or fluid?). Finally, the whole problem needs to be examined in a historical frame of reference.¹² The most useful conclusion to this essay might be some suggestions about the extent to which a unified spectatorial position may be undermined by camera movement.

11 Stephen Heath, "Anato Mo," *Screen* XVII, 4 (1976).

12 I have suggested a start in this direction in "Camera Movement, The Coming of Sound, and The Classical Hollywood Style," *Purdue Film Studies* II (1977).

If the mobile frame normally yields a strong illusion of a subjective movement through an objective space, a filmmaker can seek to disturb the objectivity of that space or disturb the subjective status of the view of that space. First, it is possible to establish a scenographic space which, in one way or another, becomes difficult to read. In Murnau's *Sunrise*, for example, the country village has been built in false perspective, and the camera movement through the village makes objects which are already unnaturally large or small swell or diminish with excessive speed. Later in *Sunrise*, when the husband goes out to meet the vamp in the swamp, the camera picks him out against the moon, swings left and through some trees to reveal the vamp, standing and waiting for him under a second moon. Disparity is built into the scenographic space itself; the profilmic event becomes contradictory. Or in many films the camera will show us a character in a locale, track or pan away, and reveal the same character elsewhere dressed differently. (Such effects occur with various inflections in films like *Vampyr*, *Last Year at Marienbad*, *The Passenger*, and *Partner*.) Obviously, offscreen space always plays a considerable role in camera movement, but most particularly here. What is violated is our expectation that the space outside our traveling vision will be homogeneous with what is within our traveling vision. These examples also indicate that these spaces become inconsistent not through a strictly perceptual interrogation of the camera-movement effect, but through narrative systems that establish norms about what could be in a scenographic space.

There is a second, potentially more radical possibility; that of troubling the subjective position defined by camera movement. At first glance, a simple device offers itself: simply stipulate that a camera is producing the image, thus foregrounding the apparatus as mechanism and not organism. But the camera point-of-view is easily read as that of a machine steered by a human subject. A camera implies a cameraperson. Our eye then becomes simply that of the camera, still comfortably moving through an objective array.

More significantly, the viewer's position in camera movement may be made difficult through the creation of inconsistent subject positions. For one thing, there are the possibilities of constructing contradictory or difficult subject positions by fracturing the image so that the camera movement is no longer rendered as the movement of a subjective eye through an objective world. Gance's superimposed tracking shots, the pendular and prismatic movements in Leger/Murphy's *Ballet Mécanique*, and the split-screen effects in Vertov's films explore this possibility. Alternatively, the camera movement can block an anthropomorphic reading, refusing it as an intelligible or likely surrogate for bodily movement. Since camera movement makes kinesthetic cues come to us through the visual channel, it's possible to present kinesthetic cues which violate some normal conceptions of how our body might move. What comes to mind immediately are those unnamed movements forbidden by the dominant narrative and stylistic systems in cinema. The assumption is that since the camera is to its support as the head is to the body, the camera cannot execute those movements that our head cannot or "normally" does not execute. To my knowledge, it is chiefly animated film and American avant-garde films which have begun to explore the possibilities of such forbidden movements; Michael Snow's *La Région Centrale* is the major film here.

Finally, there is the possibility of making a subjective-movement position inconsistent at the narrative level as well. This will often involve a playing upon point-of-view shots. At the close of Oshima's *Battle of Tokyo*, the protagonist Motoki as subject and point-of-view character, splits and so does

our position as and with him. At the beginning of a handheld shot, we are posited as seeing what he sees through a movie camera's viewfinder. But in the course of the shot, he runs out from behind the camera, into his/our viewpoint. What were his eyes, his bodily movement, and thus ours, are no longer his, and the idea of "our" position becomes highly problematic. It is a permissible play with convention to have a character enter a shot which has been initially established as her or his point of view, but *not* when that point of view is defined as that of a camera in his hands. Moreover, Motoki runs into our field of vision *carrying* the camera through which we are presumably seeing him. Our subjectivity is split, our position impossible.

As most of these examples have suggested, camera movement's impression of reality has chiefly been undermined at the level of narrative, not at the level of perceptual activity. This is probably why camera movement is usually studied as a narrative device. The ways in which the camera-movement effect yields certain perceptual cues are rarely contested. Most saliently Michael Snow's films point toward ways of making problematic the sheerly perceptual features of camera movement. Consider only one strategy, that of camera movement velocity (a strategy apparent in a film like \longleftrightarrow). At the highest speeds, or with abrupt and unpredictable stopping and starting, acceleration and deceleration, a pan shot can make it difficult to read a space as scenographic. There is produced a tension between reading the shot as the movement of a body swiveling quickly or that of a series of abstract patterns whizzing across the screen. Such a constant hesitation between readings of the image defines, perhaps, some conditions for working upon the sheerly perceptual features of camera movement. Problematic camera movements, contesting the unity of the scenographic space or the unity of the viewing subject, have impelled us to ask, "What is seen?" or "Who is seeing this?"; theorists and filmmakers must now ask, "What is this mode of seeing?"