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Visual Research

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In this chapter, we include visual observations made with the eye (participant or nonparticipant observation) as well as images produced by any means and with any instrument. "Research" will be restricted to the production of "generalizable scientific knowledge."[1] We organized the discussion around three broad fields:

1. Researcher-produced or researcher-induced images as data for analysis
2. The analysis of images produced as part of culture but not explicitly for research purposes
3. The use of images in the communication of research findings

Over each field hover two complementary/contradictory perspectives: a postpositivist representational view and an interpretivist/symbolic view.[2] Postpositivist visual research ranges from the photo forensics our colleague Jeremy Rowe (Margolis & Rowe, 2004, 2011) and Errol Morris (2007a, 2007b) use to investigate provenance and production technologies, as well as the content of 19th- and early 20th-century photographs, to the use of video to record and code micro-social interactions (McDermott & Raley, 2011; Mehan, 1993).

Visual research is not new; it is among the most ancient forms of understanding. Every scientific discipline was built on a core of naturalistic visual inquiry, from stone megaliths revealing the seasons when a sunbeam struck a stone, through Galileo's observation of the phases of the moons of Jupiter, to the central Western figure of Descartes. Cartesian perspectivalism lurks behind every major paradigm in science, including the occularcentrism that adopted the *camera obscura* as a reproducer of the observed world (Jay, 1994, p. 69) and the Cartesian coordinates that connect algebra with geometry to re-present data in visible form (Descartes, 1637/1960). Humans rely on sight to make sense of the material world and to predict future events based on current observations.

Only recently has visual research been demarked as a set of methods distinguished from the fundamental observations of science; this was partially due to the invention of photography, which has an ambiguous function. Photographs were initially thought of as "pencils of nature" (Fox Talbot, 1844/1989). As John Berger wrote, "The camera cannot lie. It cannot lie because it prints directly. . . . The camera can bestow authenticity upon any set of appearances, however false. The camera does not lie even when it is used to quote a lie" (Berger & Mohr, 1982, pp. 96–97). Berger relied on the mechanical apparatus of photography: "Photographs do

not translate from appearances. They quote from them" (Berger & Mohr, 1982, p. 96). The postpositivist epistemology emphasizes evidence provided by the mechanical apparatus. It is analogous to the geometry of vision, including experimental techniques (e.g., eye-tracking) that examine how organisms see (Olk & Kappas, 2011). Postpositivism provides a conceptual framework for identifying and evaluating information embedded within images, including still and moving pictures, employing hypothetico-deductive methods. In both the physical and social sciences, alongside parallel development of visual apparatus and scientific hypotheses, critiques of both positivism and photography took hold:

> The camera was invented in 1839. August Comte was just finishing his Cours De Philosophie Positive. Positivism and the camera and sociology grew up together. What sustained them all as practices was the belief that observable quantifiable facts, recorded by scientists and experts, would one day offer man such a total knowledge about nature and society that he would be able to order them both. (Berger & Mohr, 1982, p. 99)

Two decades later, Oliver Wendell Holmes imagined an "Imperial, National, or City Stereographic Library" where people could visit to see "any object, natural or artificial." Such a library required an indexing system, an important hallmark of science and essential for preserving and locating images (Trachtenberg, 1989, p. 16).[3] Recently, Holmes's library has approached reality with the advent of digital images, search engines, and the Internet. Our discussion of visual research will privilege both the representational or positivist use of the technology and symbolic meanings.

The hermeneutic or interpretivist position is more akin to the psychology of perception than the geometry of optics. It has been articulated by many. Sontag (1977) stated it most economically: "Photographs are as much an interpretation of the world as paintings and drawings are" (pp. 6–7). Thus, the position of the image maker and the observer became salient issues in science:

> In a postpositive and postmodern world, the camera is constrained by the culture of the person behind the apparatus; that is, films and photographs are always concerned with two things-the culture of those filmed and the culture of those who film. (Ruby, 1996, n.p.)

As Horkheimer and Adorno observed, requirements of photographic "style" introduce an element of untruth "even in the admirable expertise of a photograph of a peasant's squalid hut" (Horkheimer, Adorno, Noerr, & Jephcott, 1947/2007, p. 304). Photographic images therefore depend on cultural and scientific literacy and regardless of what they denote; they connote (at least) socially established ideological and aesthetic beliefs learned by the photographer and the viewer. Images also circulate within a system of communication. Like currency and language, photographs are "social facts" in the Durkheimian sense that images are part of what he called "the system of signs I use to express my thought" (Durkheim, 1938/1966, p. 2). These interpretivist and symbolic elements of photographs led social scientists to be skeptical of their use.

From Photographs to Analysis

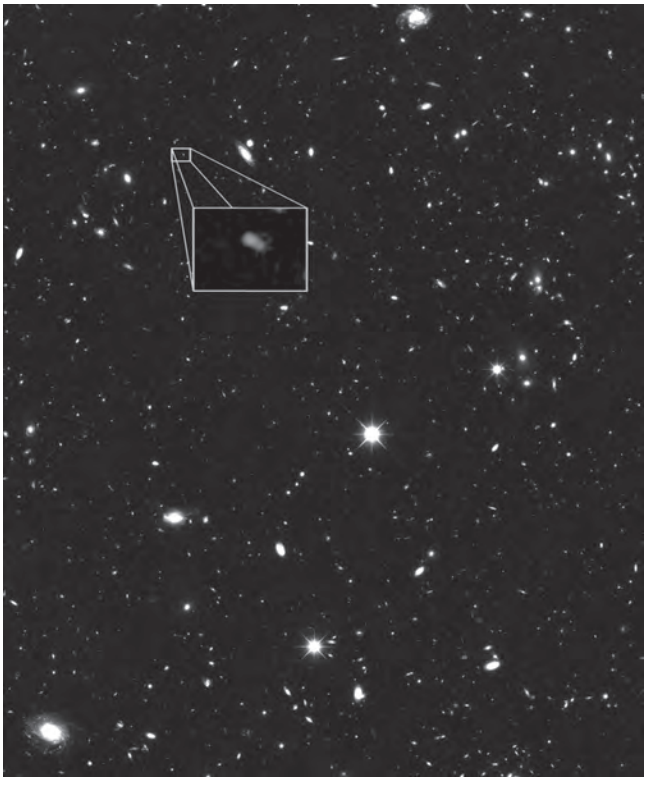
Hermeneutic approaches (freed of its biblical origins, literally "the interpretations of interpretations") use multiple theoretical techniques with the goal of understanding and interpreting the image within its larger social context. Approaches that we will discuss briefly include semiotics, grounded theory, image elicitation, and photovoice, methods that have been and continue to be used in the study of artworks, photographs, film, and video. It is their polysemic nature that allows photographs to at once have scientific value as accurate representations of things

in the world, while simultaneously functioning as iconic and symbolic communications. Moreover, Alan Sekula (1983) observed that through the traffic in images, meanings are up for grabs:

> [Archives involve] . . . the subordination of use to the logic of exchange thus not only are the pictures in archives often literally for sale, but their meanings are up for grabs. . . . This semantic availability of pictures in archives exhibits the same abstract logic as that which characterizes goods on the marketplace. (p. 194)

In the social sciences where fundamental categories like "mind" and "society" were thought to be invisible, photographic images appeared to be subjective, and "visual research" was raised as a problematic. In the physical sciences dealing with materiality and forces, visual research developed unabated. Cameras froze, and speeded-up events, microscopes, telescopes, and other aids to vision were essential to scientific projects, bringing the far away near, making the small visible, and slowing down or speeding up time. Previously invisible events were made visible via tracks in cloud chambers, traces on photographic plates, and repeat photography. Intensely manipulated photographs were accepted as proof, such as Figure 27.1, a recent view

FIGURE 27.1 This image from the Hubble Space Telescope CANDELS survey highlights the most distant galaxy in the universe with a definitively measured distance, dubbed z8_GND_5296. "The galaxy's red color alerted astronomers that it was likely extremely far away, and thus seen at an early time after the Big Bang. . . . This galaxy is seen at about 700 million years after the Big Bang, when the universe was just 5 percent of its current age of 13.8 billion years"



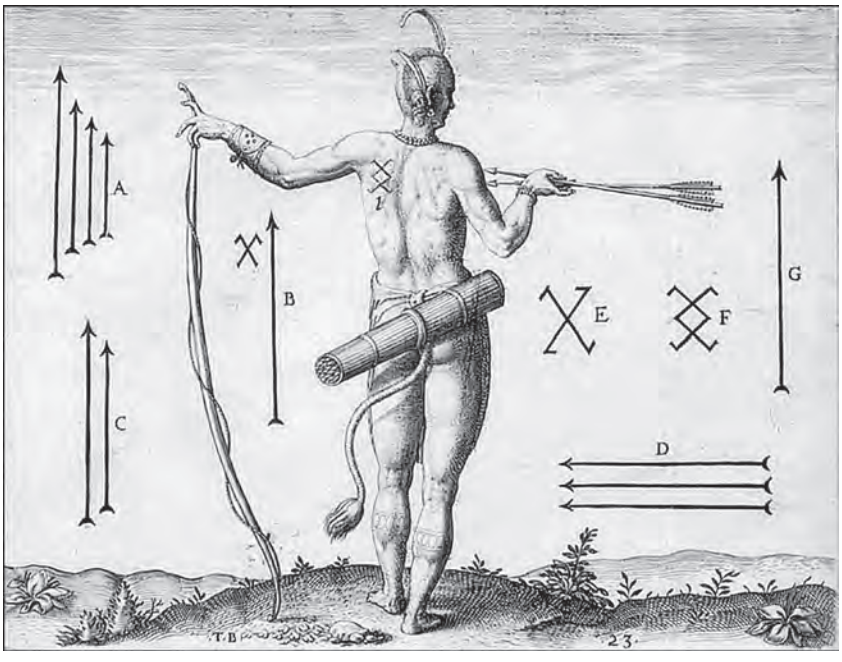
Source: STScI, NASA, ESA, V. Tilvi (Texas A&M University), S. Finkelstein (University of Texas, Austin), and C. Papovich (Texas A&M University)

from the Hubble Space Telescope of the furthest galaxy seen so far; an image of infrared light was "colorized" so human eyes can see it. Needless to say, while the little white blur in the star field has extraordinary importance to astronomers, it has equally extraordinary symbolic value to believers and nonbelievers in a 14-billion-year-old universe.[4]

Most of what follows will attend to the practical uses of image-based research in the social sciences. Even before a science of anthropology developed to understand the "other," colonial contact employed drawings (and later photography) to produce generalized knowledge. These instructions to artist John White for an exploratory voyage in 1852, and his drawing, suggest the importance of seeing and making visual records. His drawing is shown in Figure 27.2.

Sociology distinguished itself as investigations of "our" culture and early photo projects undertaken by Jacob Riis (1890/1971), Frances Benjamin Johnston (1966), and Lewis Hine (1909/1980) informed the discipline as progressive action research. By showing what was visible, their photography was an explicit call for social change: Riis made photographs of street youth and shot industrial schools as an alternative; Hine similarly photographed schools and libraries for children. Figure 27.3 is a good example. Johnston consciously depicted what progressive education would look like in an unfinished project called *The New Education Illustrated* (Westcott & Photographs by Frances Benjamin Johnston, c. 1900). Illustrations were included in professional articles in the *American Journal of Sociology* from around 1895 to 1910, but, as with the progressive era, documentarians came to be

FIGURE 27.2 "Draw to life one of each kind of thing that is strange to us in England . . . all strange birds, beasts, fishes, plants, herbs, trees, and fruits . . . also the figures and shapes of men and women in their apparel, as also their manner of weapons in every place as you shall find them differing"



Source: The sundry Marks of the Chief Men of Virginia by Theodore de Bry [probably after John White] (Engraving from book page Plate 13 from America, Part 1, 1st ed., Frankfurt, 1590 -1607) Virginia Historical Society, Early Images of Virginia Indians: The William W. Cole Collection

FIGURE 27.3 Immigrants at night school. Boston, October 1909 (Lewis Hine).

Source: Library of Congress, Prints & Photographs Division, National Child Labor Committee Collection, LC-DIG-nclc-04549

critiqued as subjective, limited, quaint, manipulated, and personal creations (Henny, 1986; Stasz, 1979, p. 120).

Only in the mid-20th century, when the positivist project of discovering "natural laws" was itself challenged as "framed," did visual research and photographic "evidence" return to the social sciences; unfortunately, "visual" was segregated as distinct methods of the broader methods of "research" (Asch & Chagnon, 1975; Collier, 1957, 1967; Gardner, 1963; Harper, 1979; Worth & Adair, 1975). We do not think the wheel needs to be reinvented; visual research has emerged as an "artful science" (Harper, 2012). In place of paradigm wars, we have complementary views suggested in Harper's term: Symbolic and iconic meanings can abide side by side. For instance, technology has enabled users to document every moment of their lives using wearable and cellphone cameras. The latest pattern recognition software is rapidly changing visual data collection and analytic practice. If we view these changing digital landscapes through the lens of "artful science," they seem to be complementing visual research (VR) by eliminating laborious and tedious data coding and synthesis processes through data reduction, producing new relationships between visual ethnographers and emergent technology. This association deserves special attention because visual research is growing to be more interdisciplinary.

Other technological developments, including digital images, vast virtual image archives, geographic information systems (GIS), social media, and photo-sharing outlets, have greatly altered visual researchers' potential to produce, gather, and represent data. Traffic in digitized images on the Internet makes possible new forms of visual ethnography, analogous to a kind of archeology.

Film and Video Cameras as Data Creation Technologies

Ethnographic Mapping

"Simple observation" was a premier method that Eugene Webb and his colleagues termed "unobtrusive measures" (Webb, Campbell, Schwartz, & Sechrest, 1966). Observers, in person, noted behaviors and recorded field notes, sometimes accompanied by sketches. As the frontpiece to his book *Visual Anthropology,* John Collier (1967) quoted Émile Zola:

> We no longer describe for the sake of describing, from a caprice and a pleasure of rhetoricians. We consider that man cannot be separated from his surroundings, that he is completed by his clothes, his house, his city, and his country; and hence we shall not note a single a single phenomenon of his brain and heart without looking for the causes or the consequence in his surroundings . . . I should define description. "An account of environment which determines and completes man." (Zola, 1893, p. 232)

Photographic technology in sociology and anthropology emerged as the adjunct to simple observation. Mead and Bateson (1942), for instance, recognized that cameras could do a better job recording dress, demeanour, or dance than even the most perceptive observer with a pencil (Becker, 1981). A few years later, John Collier (1967) suggested using photography to "map" materialities, including the tools and utensils in a person's home, spatial relations in a village square, or the proximity and actions of bodies in space. Cameras employ the indexical ability to produce images of things in the world.

Collier termed the initial step of using cameras as "Photographing the Overview" and described photographic maps or site surveys as "the first phase of field work," including imagery from aerial photography down to detailed photographs of a kitchen area (Collier, 1967, p. 17ff). An example is a pair of photographs taken in 1943 in Penasco, New Mexico, by John Collier's son, John Jr., who worked as a photographer for the Farm Security Administration. They help the researcher perceive material culture and relationships in space and may also provide information for a catalogue: farms, scrub land, hats, tools, dress, and so on.

Following in this tradition of visual "overview," photo journalists such as Peter Menzel and James Mollison have produced important works: globally comparing and visually contrasting material culture, people's homes, and possessions in the book *Material World: A Global Family Portrait* (Menzel, Mann, & Kennedy, 1995); foodstuffs and diet eaten in a week in 34 countries in *Hungry Planet: What the World Eats* (Menzel & D'Aluisio, 2007); and paired portrait photographs of sleeping quarters in *Where Children Sleep* (Mollison, 2010). Not only do the images depict slices of material culture, but they also create rich overviews of comparative wealth, cultural preference, and the use of space. Thus, the images both "quote from reality" and symbolic meanings are employed in the "artful science." The photo essays stand on their own with only the briefest captions but also serve as fuel for sociological imaginations. Perhaps most important, while published as relatively expensive "coffee table" books, the images are all over the Internet and can be seen and studied for "free."

Micro-Ethnography

Micro-ethnography has a smaller scope and focus than ethnography. It examines discrete actions or smaller units of social behaviors, with no immediate concern for the surrounding culture. We use the term *micro-ethnography* to encompass a variety of theoretical and methodological approaches, including experimental methods, ethnomethodology, some forms of discourse analysis, interaction analysis, symbolic interaction, and others. What they have in common is

FIGURE 27.4 Penasco, New Mexico. The valley, looking down on the site of the new clinic building operated by the Taos County cooperative health association.

Source: Photograph by John Collier Jr. Library of Congress, Prints & Photographs Division, FSA/OWI Collection, LC-USW3- 013822-C for the Farm Security Administration/Office of War Information

close observation of the visible ways that society is created as a product of human interaction. Early use of visual experimental methods was grounded in detailed observation and coding of researcher-induced, subject-produced drawings such as Florence Goodenough's "Draw-a-man Test" (Goodenough, 1926). A paradigm example of observation of behavior in public places is David Efron's *Gesture, Race and Culture: A Tentative Study of the Spatio-Temporal and "Linguistic" Aspects of the Gestural Behavior of Eastern Jews and Southern Italians in New York City, Living Under Similar as Well as Different Environmental Conditions* (Efron, 1941). Efron's motivation to refute fascist notions of racial superiority foreshadowed Kenneth and Mamie Clark's observation of children's interaction with dolls and children's drawings that revealed effects of prejudice and school segregation—powerful enough to influence the Supreme Court's decision in *Brown v. Board of Education* in 1954 (Clark & Clark, 1950).[5]

In micro-ethnographic approaches, drawings, photography, or video are produced purely for research purposes. Visual ethnographic data are similar, then, to forensic photography of a crime scene. Skill with cameras may only consist of basic lighting, framing, and depth of field. Video has been used fruitfully to record small and large group interactions (M. Ball & Smith, 2011; Derry et al., 2010; Goldman & McDermott, 2007; Knoblauch & Tuma, 2011; Mehan, 1993). The ability to stop motion, replay, and analyze human interactions has been a boon to an overall theory of what Ray McDermott has called "A Natural History of Human Ingenuity":

> A small, but alternative visual tradition that has developed on the edges of mainstream social sciences. The tradition has no single name, but for the last half-century, it has drawn heavily from ethnography, interaction and conversation analysis, sociolinguistics, and kinesics. To describe

FIGURE 27.5 Penasco, New Mexico. Pouring the foundations of the new building for the clinic operated by the Taos County cooperative health association.

Source: Photograph by John Collier Jr. Library of Congress, Prints & Photographs Division, FSA/OWI Collection, LC-USW3- 013821-C for the Farm Security Administration/Office of War Information

> the approach, we call on (and impose) the term: natural history . . . a natural history analysis examines organisms and environments interwoven in real time in situations consequential to their participants and beyond. (McDermott & Raley, 2011, p. 373)

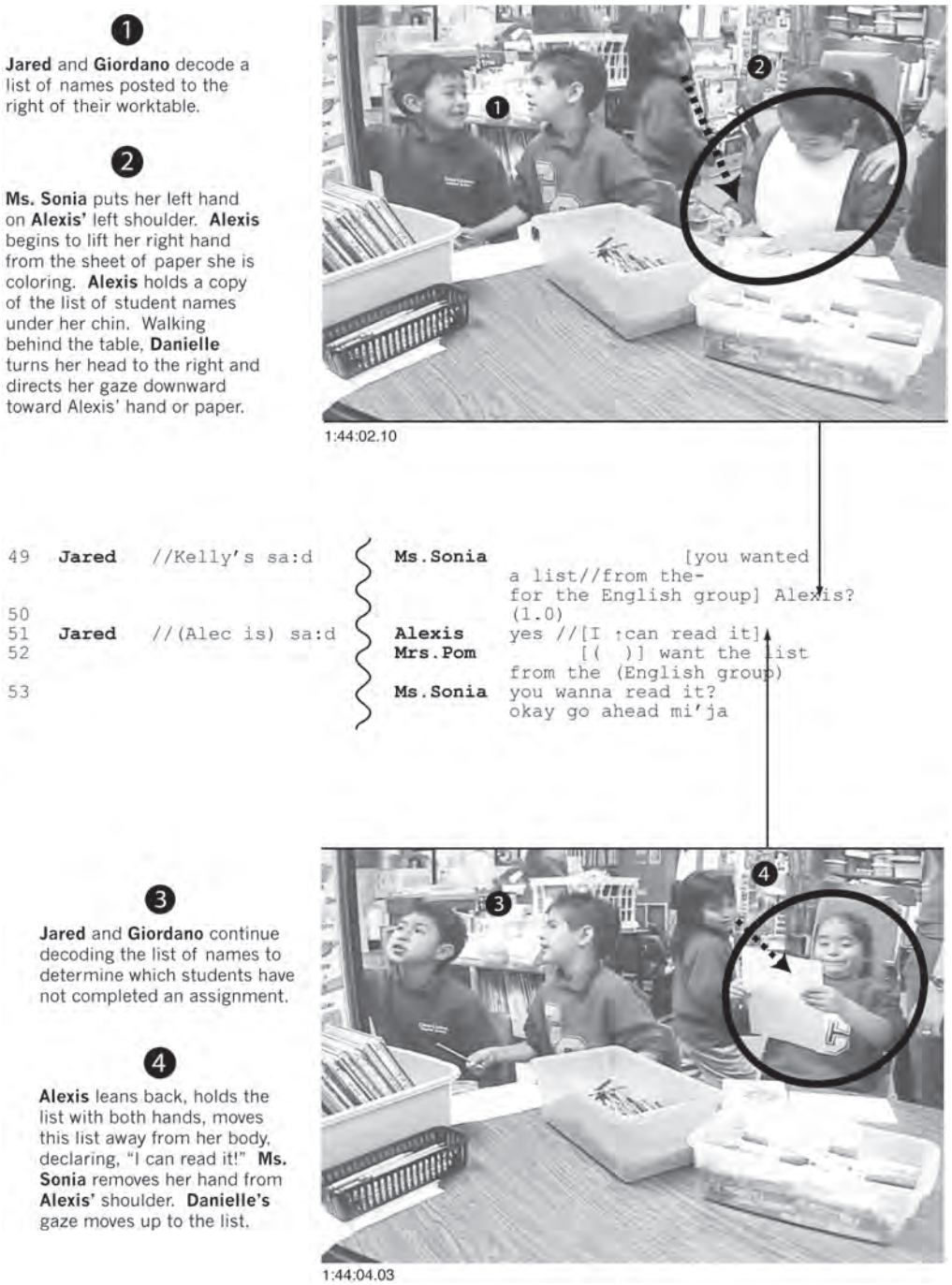
Visual researchers such as McDermott and Sarah Pink (2009) include all human senses of visible materialities, actions, and interactions as essential to sense making. Video creates a way to study "real-time" interactions in minute detail. Frames are printed, coded, and annotated to draw attention to details and reconstruct complex patterns of action/reaction with the material world and interaction with others. Figure 27.6 reproduced two stills from a video of children in a reading lesson; they illustrate 2.07 seconds of data for the kind of close observation and coding of a classroom interaction, demonstrating that

> the first revelation of a natural history approach is that "can read it" is much less a property of individual minds—it's not personal property at all—and more the systematic product of real people pointing at, gathering around, interrupting, and tugging on other real people and real objects in real time—sometimes with and sometimes without regard for who really can or cannot read. It's all in the sometimes and in the work of the people who put them together. (McDermott & Raley, 2011, pp. 382–387)

Making and analyzing either still or moving pictures in research is far more complex than one would expect:[6]

The power of video records is not in what they make easily clear, but in what they challenge and disrupt in the initial assumptions of an analysis. They are a starting point for understanding the reflexive, patterned ways interactions develop, and often must develop, inside the structures and interpretations with which kids, teachers, and researchers establish their work. (Goldman & McDermott, 2007, p. 101)

FIGURE 27.6 "I can read it"



Source: McDermott, R. C., & Raley, J. (2011, p. 393).

The problem becomes thornier in larger scale visual ethnography projects. Michael Ball and Gregory Smith discussed the centrality of the visible in ethnomethodology (EM) (M. Ball & Smith, 2011), tracing it to Garfinkel's 1948 essay on "Seeing Sociologically" (Garfinkel, 1948/2006). As they noted, "What sets EM apart from most other sociological approaches is its determination to observe and analyse ordinary social practices as they actually occur" (M. Ball & Smith, 2011, p. 392). In these endeavors, the ability to record social action for later detailed examination is facilitated by video, but the recordings are not necessarily employed in the public presentation of findings. Other visual ethnographers may use found images and reproduce them for educational or public viewing or use their recordings for illustrative purposes;[7] the core approach is studying images as data, as in Knoblauch and Tuma's study of sequential actions and reactions during an auction where video made it possible for the researchers to view two things at once represented in Figure 27.7 (Knoblauch & Tuma, 2011).

FIGURE 27.7 Video cameras had recorded an auctioneer soliciting bids and the audience responding to his cues. The two takes could be "synced" so the ethnographers could examine social actions in detail.

Source: "Split Screen" (auctioneer/audience) sourced from video by Degenhardt, from Knoblauch & Tuma, 2011, p. 42.

Research for Public Viewing

Another possibility plays on the term *ethnography* itself. On one hand, ethnography refers to a set of methods for gathering information; on the other hand, it is the name for one's discussion/analysis in written or other media. If researchers are to present their ethnography visually, then alongside the skills of photographer or videographer, they need skills in visual communication, media literacy, and editing, as Jay Ruby noted four decades ago (Ruby, 1975). The question of whether to use photographic images of people in displaying research findings raises critical

questions of ethics, confidentiality, access, copyright, and informed consent. It also highlights a key difference between social science "research" and the research done by journalists and artists. With the advent of institutional review boards (IRBs) and ethics panels, it has become increasingly difficult to engage in visual research using methods that ensure neither anonymity nor confidentiality. Journalists and photographers routinely collect releases to use recordings of people. Use of cameras may also be covered by access to "behaviour occurring in public spaces" where participants have no expectation of privacy. The central distinction for ethics panels is that artists and journalists are producing "stories" with no generalizable theory. There is a similar dilemma for those who use copyrighted images for the purpose of critique: There is a gray area of "fair use," and some producers have been threatened for violation:

> Using clips from 165 music videos he taped at home, the professor, Sut Jhally, produced a video titled "Dreamworlds: Desire/Sex/Power in Rock Video," for classroom use as part of his analysis of how women are portrayed in music videos. He concluded that they appear mostly as sex objects or "nymphomaniacs" and used as props to sell music. . . . In a letter dated March 25, MTV threatened to sue, saying the professor violated copyright laws by using an MTV commercial and the music videos, rights to which are owned by record companies. ("A Professor's Class," 1991, n.p.)

On one hand, because social scientists, for the most part, do seek to produce generalizable scientific knowledge, they are bound to obtain both informed consent from all participants, assent from children, and a release form if the images are to be shown outside the lab or office.[8] Researchers may also be unable to record *protected populations,* including children, people engaging in illegal behavior, and people with some kinds of disabilities that might prevent them from understanding the consent and release forms. Thus, it is highly unlikely that visual research such as Wiseman's *Titticut Follies* (1967) or *High School* (1968), the films made by Stanley Milgram (1964) as part of the "Obedience" experiments, or many classic visual anthropology films such as Robert Gardner's (1963) *Dead Birds* or Asch and Chagnon's (1975) *The Ax Fight* could be made today—especially if grant money or university affiliation was involved. An essential aspect of the informed consent forms is that "you may also withdraw from the study at any time; there will be no penalty." This means that if any of the above films were covered by informed consent, and sometime after seeing the film a participant sought to "withdraw from the study," it is likely that the film could no longer be produced or shown.

On the other hand, creative nonfiction films and video programs have an undeniable basis in visual research but include everything from natural history, such as the highly acclaimed series of 11 programs in *Planet Earth* (BBC Natural History Unit, 2006), to historical incidents, such as Ken Burns's mini-series *The Civil War,* to *An American Family,* the controversial Public Broadcast series (Gilbert, 1971). The term *documentary* has become a catch-all phrase for any visual creative nonfiction. Burns and others producing *The Civil War* "encountered thousands of 'facts' about the war in the form of pictures, letters, statistics, maps, and other kinds of evidence" (Toplin, 1996, p. 21) but did not consider the found images as *data* to be interrogated, but merely as illustrations to be panned, zoomed, and tilted on to create a simulation of action.[9] In these cases, the term *documentary* has become devoid of meaning. The videos of Ken Burns remain historicist and positivist, as Alan Sekula's (1983) critique made clear:

> (The very term document entails a notion of legal or official truth, as well as a notion of proximity to and verification of an original event.) Historical narratives that rely primarily on photography almost inevitably are both positivist and historicist in character. For positivism, the camera provides mechanical and thus "scientifically" objective evidence of data. Photographs are seen

> as sources of factual, positive knowledge, and thus are appropriate documents for a history that claims a place among the supposedly objective sciences of human behavior. For historicism, the archive confirms the existence of a linear progression from past to present, and offers the possibility of an easy and unproblematic retrieval of the past from the transcendent position of the present. (pp. 198–199)

Exceptions include the creative nonfiction of Michael Moore, Jean Kilbourne, and Sut Jhally, whose productions are termed *documentary* but, like Riis and Hine, are intended to provoke social change. Moore's comic style disrupts the postpositivist tradition by introducing a "star" and staged events alongside "shoot-from-the-hip" recordings of events and interactions. Moore's videos have critiqued the auto industry's disregard for workers, capitalist globalization, gun ownership, the war in Iraq and Afghanistan, and the health care system in the United States. Feminist approaches have contributed mightily to critical visual research. Jhally and Kilbourne, working together and separately, use advertising images, clips from popular films, and music videos to critique representations of gender and to bring that critique to a wide audience.

Research intended for audiences beyond academia may well include website and hypertext constructions, and GIS. New digital technologies facilitate ways of sharing ethnographic and other fruits of visual research. In the past, research presentations were lineal. In the case of film or video, this is obvious; written work is also read lineally, although the use of an "index" facilitates other kinds of searches. Nonlineal presentations allow viewers to examine the visual and aural data at their own pace and in keeping with their interests. Presentations may be based on a GIS map. For example, Dan Collins and his colleagues (Margolis is one) are building a Participatory Geographic Information System (PGIS) examining the Colorado River basin, emphasizing video "stories" told by those who use the river along with other video and still images. They are building a hypertext website allowing users to skim the surface or delve deeply into historic and current stories of the river. One can listen to interviews with young people who raft the river or read the journals and examine historic photographs of John Wesley Powell's trip down the Grand Canyon.[10] Perhaps more important, the advent of digital cameras and smartphones with built-in GIS capabilities will allow people to post their own images and reactions. Roderick Coover and Mark Klett are developing similar hypertext documents.[11] Lineal presentation of "ethnographic film" has always been problematic; the hands of the ethnographer/editor are all over the work as Jay Ruby and Max Horkheimer alluded to above. Some have argued that only the raw footage is ethnographic, not the edited presentation. Hypertext documents make it possible to include all the raw footage as well as field notes and other data in the online site so that questions about "peasants' squalid huts" can be raised and answered. Hypertext can function as the research "audit trail" if, for instance, video clips can be traced to the raw footage or quotations linked to the interview transcript (Thomson, 2014).

Rephotography

There is a long history of repeat photography, the practice of taking photographs of the same person or site at different times, and it has served many purposes. Probably early in the Victorian era, professional photographers began to make sequential images to document a child's growth. In the 1870s, as John Tagg (1988, pp. 84–85) noted, before-and-after photographs of children at "Bernado's Home for Destitute Lads" in London were used to depict the children as they arrived and after having been schooled, scrubbed, and clean. The images were used for fundraising and were heavily manipulated to make the comparison more dramatic. In the 1880s, similar repeat photographs were made at the Carlisle Indian Boarding school in Pennsylvania. The before-and-after photographs made at Carlisle were called "propaganda" by Captain Richard

Pratt, the school superintendent, who ordered the pictures to be made. It has also been alleged that the images were manipulated to "whiten" the Native Americans (Margolis & Rowe, 2004). Manipulated or not, the images count as generalizable knowledge because they were made to demonstrate the positive effects of social scientific theories of environment and behavior used to justify institutions for socializing the other, including runaway, castaway, or homeless street youth.

A century later, Mark Klett and colleagues (Klett, Manchester, Verburg, Bushaw, & Dingus, 1984) undertook the "Rephotographic Survey Project" (RSP) based on original photographs made by Timothy O'Sullivan and other photographers who had been brought along by "pioneer" surveys of the western United States. The researchers coined the term *rephotography.* The project of landscape photography employed "Photogrammetry," techniques developed in the 1700s for careful measurement to produce maps or models in land surveys. With the invention of rephotography, photogrammetry used points in one image to make a second photograph that exactly mirrored the first. Klett and his colleagues estimated the position where the original photograph was made and took a Polaroid shot. After identifying five points in each image, they used them to measure changes along the x, y, z axes, thus enabling precise rephotography. Precision was important in postpositivist natural history; rephotographs were useful for geologists and climatologists to measure weathering and sedimentation. In the RSP project, Klett questioned the future of rephotography but could not have imagined the technology he now uses in the field—digital cameras, computers, battery-powered printers, and the ability to directly superimpose one image on another (Klett, 2011, pp. 118–119). Nor could he foresee that GPS systems and phone cameras would enable "apps" such as Timera to allow anyone to make accurate rephotographs. Nevertheless, the answer by Klett et al. (1984) to his question is important:

> Change is in store for the region known as the Great West. The major impact of mining, urbanization, and continued development along with the slow but sometimes catastrophic effects of nature will be felt in the years ahead. From the standpoint of monitoring physical changes, programmed rephotography can provide detailed perspectives. . . . . Rephotography should be viewed as a continuous process, and each image should be challenged and not regarded as a final statement. (p. 40)

Rephotography has been employed in the natural sciences to measure the retreat of glaciers and the effects of drought on water supplies (e.g., "350 days in the life of a retreating glacier"). In this case, the rephotography project serves postpositivist measuring purposes but is also circulated on the Internet where the symbolic meanings of the melting ice reach a wider audience interested in climate change.

> The Extreme Ice Survey is the most wide-ranging glacier study ever conducted using ground-based, real-time photography. EIS uses time-lapse photography, conventional photography, and video to document the rapid changes now occurring on the Earth's glacial ice.[12]

Rephotography has also been used in the social sciences to observe social change where geographic precision is less central to meaning (Rieger, 1996). Figure 27.8 is a mashed-up rephotograph of the town of Trinidad, Colorado. The top photograph is dated 1890–1891 when the boom town was the hub of the Southern Colorado coal industry. It is superimposed on a photograph of the town taken in 1984, after Interstate 25 was constructed. The elevated highway bypassed the town, contributing to its demise. The symbolic meanings of social changes via rephotography have moved far beyond photographs made by sociologists, to become Internet memes. "New York Changing"[13] is a popular site, and Scotland has a public

FIGURE 27.8 Mashed-up rephotograph of the town of Trinidad, Colorado.

Source: Trinidad, Colorado, 1907 photo by Glen Aultman superimposed on a photograph made by Eric Margolis in 1984.

rephotography site where people are encouraged to upload their own photographs.[14] A site such as Photosynth Computational Rephotography enables "mash-ups" in which sequential photographs are replaced by single images merging old and new. World War II has been a popular topic pioneered by Sergey Larenkov, a Russian Photoshop master and photographer.[15]

Image Elicitation

Image elicitation (IE) includes ways of including visual images in qualitative/interpretative research (Collier, 1957; Harper, 2002) or in quantitative studies (J. Ball, 2014). Images can be researcher-generated, subject-generated, or found objects. People enjoy showing and talking about pictures; drawings, paintings, photography, or moving images can also be employed. In Margolis's qualitative research on the visual and oral history of coal mining, he asked respondents if they would share family albums or their own photographs; each one came with a story that would be highly unlikely to emerge from an interview prompt. The idea was sparked by a 1975 interview; 81-year-old Welshy Methias asked us to "go right in the house and grab that geographic magazine on the cupboard [Figure 27.9]. Now look through there and see where I was born." That's "East Road, Tylorstown" in Wales, where he grew up. He and his brother worked in the mines as children "before we were 12," "had to work to get something to eat."

John Ball (2014) took a quantitative approach to found images in architectural research using Google Earth and Street View. What can one say about Google's vast resources? Even Oliver Wendell Holmes's dream of a photo-library of everything is pale in comparison to a technology that is at once an ethnographic mapping tool, a visual treat, and a creepy reminder of the panoptical society.[16] The software can be manipulated to provide aerial images of nearly

FIGURE 27.9 Henry Methias holding a copy of *National Geographic Magazine.*

Source: Henry "Welshy" Mathias, interview by Eric Margolis and Ronald McMahan, July 2, 1975. The Coal Project, University of Colorado Archives.

every place on the planet and connect to the growing database of individual street view locations. One can pan, tilt, and zoom in many locations. Time sliders allow one to perform repeat photography. Thus, online mapping and photographic resources fit both the category of culturally produced and researcher-produced images; the interactive component allows researchers to upload their own images.

John Ball's (2014) dissertation in Design, Environment, and the Arts, *Architectural Street Credibility: Reframing Our View of Contemporary Architecture to Sidewalk Level With Images From Google Street View,* employed images harvested from Google Street View, selecting buildings that are generally thought of as "masterpieces" of architecture (see Figure 27.10). John created a Delphi panel of graduate students to generate a list of adjectives describing the street view. From 175 words, he settled on 7 positive and 7 negative words used in a survey instrument:

> The photo-semantic assessment survey instrument was administered to 62 graduate students. . . . Respondent preference for the building images was then ranked ordered and correlations were run against various image factors including facade complexity, transparency, and streetscape quality. (J. Ball, 2014)

An outstanding exemplar of image elicitation is Joseph Tobin's ongoing work on preschool (Tobin, Wu, & Davidson, 1989; Tobin, Yeh Hsueh, & Karasawa, 2009). With his coauthors, Tobin videotaped "a day in the life" of preschools in Japan, China, and Hawaii. These tapes were used in what they termed *video-cued multivocal ethnography,* that is, they were shown to educators in each of the cultures to elicit cross-cultural discussions of schooling practices (see Figure 27.11). This is also an example of reflexive approaches to ethnography that seek to give participants a measure of control over the product—written or visual. The initial study was done in the early 1980s and a follow-up completed about 20 years later. The comparisons were now both cross-cultural and diachronic, across time. The use of video was essential to mitigating language

FIGURE 27.10 Composite photograph created by John Ball (2014) by collaging together 10 screen-grabs from Google StreetView images. The building is the San Francisco Federal Building by Thom Mayne of the architectural firm Morphosis.

Source: Ball, J., *Architectural Street Credibility: Reframing Contemporary Architecture to Sidewalk Level with Images from Google Street View.* Arizona State University, Tempe, AZ (2014).

FIGURE 27.11 Still photograph from the original *Preschool in Three Cultures* showing Tobin and his colleagues examining a video record.

Source: From the original (1985) study *Preschool in Three Cultures*. Courtesy of Joseph Tobin.

barriers and functioned to elicit rich reflections from teachers and administrators. Moreover, the videos themselves stand as excellent teaching tools both for early childhood education but perhaps, more importantly, for classes in qualitative methods and visual research.[17] *Preschool in Three Cultures* is also a form of Photovoice.

Photovoice

Photovoice (PV) is a research tool to produce collective knowledge involving active participation of community members. As the name suggests, it employs imaging techniques to "voice" needs and assets of the community and, in some cases, to catalyze social change. Like other methods, photovoice has benefits and limitations, but with widespread access to devices including cameras and smartphones, it is empowering people to share unique insights about their communities. In one of the most widely seen videos, Zina Brisky and Ross Kauffman adopted photovoice, providing cameras to the children of sex workers in Songachi, the red-light district in Calcutta. *Born Into Brothels* was particularly powerful in helping children with stigmatized lives to photograph their world, a world unknown to many. The video won an Academy Award for best documentary; it has also been critiqued for portraying children and sex workers as victims:

> Formulating the sociology of sex work in Kolkata is complicated, given the burdens of popular representation surrounding both Kolkata and its sex industry illustrated most vividly by Briski's Born into Brothels and its complete denial of sex-worker agency in Sonagachi. (Kotiswaran, 2008, p. 583)

Like many other social research projects, PV "shoots down," frequently focusing on powerless populations: the homeless (Hubbard, 1994), ghetto and reservation children (Hubbard, 1991, 1994), rural Chinese women (Wang, 1999), dialysis patients (Allen & Hutchinson, 2009), those confined to wheelchairs (Berland, 2007), and projects addressing AIDS and HIV (Mitchell, 2011). The method goes beyond the conventional approaches of survey, interviews, and observation

to involve community members in creative participation. Lorenz (2010) developed a list of questions for adult brain injury survivors to guide them through the process of taking pictures. PV has three main goals: to enable participants to "show" community's strengths and concerns, to encourage critical dialogue through discussion of images, and to reach policy makers (Wang & Burris, 1997). As a method, photovoice produces in-depth data within vivid contexts. The strength of photovoice is to learn from individual and group perspectives (in this it is similar to photo elicitation); it is also to construct narratives to present to the outside world. There are potential risks. Wang (Wang & Burris, 1997) faced challenges audiotaping participants' narratives in Yunnan from rural China because participants feared self-incrimination. Joanou's (2009) street youth photographed illegal activity. Photovoice projects may require cooperation from stakeholders within the community presenting conflicting gridlocks; this may affect quality of the data.

Despite these methodological constrains, photovoice has been adapted in diverse ways: health promotion, participatory evaluation, public health and awareness issues, and so on. In 2012, the Abrolhos Island Photovoice and Seeing Change project team used the method to study a local fishing community's experiences at Abrolhos Islands, a chain of 122 islands that lie approximately 70 km off the Western Australian coast. Fishers documented their perspectives on environmental and social changes that have occurred in past 5 to 10 years in the rock lobster industry. This shows that today's technological advancements in the field of visual recording and sharing can stretch impacts to spread knowledge wide beyond geographical boundaries, sometimes far across the globe.

Research Into Visual Images Produced as Part of Culture

Grounded Theory

Grounded theory (GT) makes a nice segue from researcher-made or elicited images to research into images produced as elements of culture.[18] It serves both fields equally well. Ethnographers have long used the tools of GT, as Charmaz and Mitchell (2001, p. 160) noted:

1. simultaneous data-collection and analysis,
2. pursuit of emergent themes through early data analysis,
3. discovery of basic social processes within the data,
4. inductive construction of abstract categories that explain and synthesize these processes, and
5. integration of categories into a theoretical framework that specifies causes, conditions and consequences of the process(es).

These basic processes have been undertaken in video-ethnography as well, with the additional process of coding visual data as well as audio and field notes. GT will work equally well in research into historic or other images harvested from digital collections and archives. For a project examining school photographs in the Farm Security Administration/Office of War Information (FSA/OWI) online archive, Margolis based his methods on GT as described by Glaser and Strauss (1967). They recommend approaching one's subject "naively," that is to say, not by steeping oneself in the literature but by direct observation. Instead of observing and interviewing, I viewed photographs and captions using the methods of constant comparison and coding in an ongoing search for meaning (Strauss, 1987). I am, of course, not naive about either photography or school—having written about historic photographs in general and school photography in specific (see Margolis, 1994, 1999). Moreover, I had previously browsed the FSA/OWI collection and was familiar with its history. Nonetheless, I wanted the photographs to make the first impression. As Caroline Arms (1999) noted in discussing problems of digital

archives, "An image does not describe itself. Words are needed to indicate the place or event represented in a photograph, its creator, the names of people portrayed, and when it was taken." Therefore, I began searching the caption files and then examined the images (Margolis, 2005).

The research process is intuitive. A program called ThumbsPlus[19] was used to create folders (initial coding categories) "on-the-fly." Some categories: state and photographer names, school lunch, World War II, gardens, African Americans, and so on. In total, 4,465 photographs were downloaded and coded, often into more than one folder. Rough counting procedures as well as semiotic and interpretivist readings were used, and simple codes evolved into more theoretical codes; one conclusion was that of the null category: in the entire FSA/OWI collection there was not a single photograph of an integrated school with Black and White students (Margolis, 2005).

Semiotics

Visual semiotics (VS) is a complex of methods that has been used to analyze how meaning is accomplished by visible signs. Deeply rooted in linguistic studies, visual semiotics is concerned with what images mean. Frequently, VS is a form of action research. For example, how can images be designed that will convey meanings of toxic or radiation hazards across cultures and through generations? Or how can we use photographs to create a brand (Nadin & Zakia, 1995)? In this section, we briefly review VS theory while noting that traffic in images has reached a crescendo thanks to digital everything. The future of semiotic analysis is bright and growing with new technological advancements.

French linguist Ferdinand de Saussure (1857–1953) is considered the founder of semiotics. However, Boradkar (2010, p. 215) noted that Greek physician and father of Western medicine, Hippocrates (ca. 460 B.C.E. to ca. 370 B.C.E.), practiced semiotic theory. According to Hippocrates, the body displays semeions ("marks" or "signs") in terms of high fever, skin rash, or swelling, and the doctor reads it as tangible evidence of a subvisual condition (disease) inside the body. Many centuries later, Saussure proposed a dyadic model of sign, creating a twofold but arbitrary relationship of signifier and signified. For example, a bottle is called so because it has a designated code in English language. If it has some other name and we all agree to it, it would work just fine.

Charles Sanders Peirce (1839–1914), the American philosopher, developed a classic triadic approach to semiotics that is often represented in the form of a triangle with three coordinates: sign, object, and meaning. According to Peirce, a sign can be a word, picture, or a mental image. When it is associated with something else, the second coordinate of the triadic appears, the "object" (referent). The sign's association with the referent leads to the third coordinate, "meaning" or interpretation. Roland Barthes built upon both concepts to develop a more applied method. He explored the following questions: "What do images represent?" (termed *denotation*), and "what ideas and values do the people, places, and things represented in images stand for?" (that is *connotation*) (Van Leeuwen & Jewitt, 2001, pp. 92–118). Barthes demonstrated the application of his method by discussing a famous example of a cover page of a 1954 edition of Paris-Match in his book *Mythologies,* one of the most influential books in semiotics (Barthes, 1957/2013). Disciplines using semiotics include but are not limited to communication, cultural studies, film studies, industrial, and graphic design. A new area where semiotics is used heavily is user interface research and design (Nadin, 1988). Semiotics offers possibilities to compare semiotic structures from the physical world (e.g., user behavior) and software interfaces (Sacher, 2002). *Lisa* was the first computer to offer Graphical User Interface (GUI), allowing users to interact with the computer through icons instead of text-based interfaces and typed commands (Nadin, 1988). We adapted the following "icon quality framework" from an online article about semiotics in icon design.[20]

FIGURE 27.12 Camera.

FIGURE 27.13 Global symbol.

FIGURE 27.14 Lock.

Source: icondrawer.com.

"Concreteness" explains the degree of pictorial resemblance to the real-world counterpart as the camera (Figure 27.12); "complexity" emphasizes the detailing and convenience of finding the icon. For instance, the familiar global symbol (Figure 27.13) and the lock (Figure 27.14) illustrate semantic resemblance highlighting closeness between icon and represented function. Semantic resemblance is often the best predictor of user performance, as in many familiar computer glyphs. Icons can evolve from pictographic representations counterintuitively; as they become more abstract, they become more recognizable.[21]

In the fields of design, theoretical considerations of things are frequently accompanied with empirical observations of people's interactions with things because they are fundamental to how meanings are formed. Suggesting "the form follows meaning" rather than function, Krippendorff and Butler (1989) emphasized context-dependent meanings (Boradkar, 2010, p. 229). For example, a tennis ball used to play tennis or cricket can be found attached to walkers used by older adults and became a creative element of some interesting furniture pieces. The Ball Boy Stool designed by Charles O'Toole in 2004 was designed using the last tennis balls that were the last few to be manufactured in Ireland.[22] His design was a symbolic political commentary on the outsourcing of manufacturing goods to the nations providing cheaper labor (Boradkar, 2010, pp. 231–232). Similarly, theory and methodologies of semiotics long employed as tools in advertising and marketing (Nadin & Zakia, 1995) are also adapted in academia in diverse fields such as cultural studies, material culture studies, and anthropology (Bohnsack, 2008; Sacher, 2002; Umiker-Sebeok, 1979; Van Leeuwen & Jewitt, 2001). The field of semiotics emphasizes that the meanings of things and images are completely context dependent and generated through interactions of multiple elements within social and cultural structures. Meaning should not be looked upon as an inherent characteristic because it can never be owned, only created.

Today, the boundaries between physical and virtual worlds are more blurred than ever, and products are being designed for physical, virtual, and hybrid interactions. The rise of wearable devices, smart cars, and smartphones with simulated social intelligence are restructuring human lives, and icons, glyphs, and images are significant parts of it. VS has enormous potential to tackle multidimensional design challenges and has become an important tool in today's highly graphic world.

FIGURE 27.15 Tennis balls repurposed as feet for an assistive device. Photograph by Eric Margolis, 2015.

Source: Eric Margolis, 2015.

New Worlds of Image Research

Anyone with Internet access can find billions of images to be used for research of many kinds. The web is a virtual archive with sites such as American Memory, Pinterest, Reddit, and Google Earth. Many images are covered by creative commons licenses or are in the public domain. In this short section, we discuss historic and "found" photographs. As we have demonstrated, images of all kinds produce two kinds of meanings and are studied in modes we have called "postpositivist " and "interpretivist." Postpositivist analysis relies on the indexical and iconic quality of images and their ability to represent things in the world (what Roland Barthes called "Denotation"). The researcher collects information about the date the image was made, equipment available at the time, and as much sociological data as can be gathered about the location and image maker—our colleague Jeremy Rowe termed this "photo forensics" (Rowe, 2002). Thanks to historians of photography and avid collectors, much is known about chemical and optical processes; local photographers have been cataloged (e.g., Rowe, 1997); and in the case of important events such as wars, vast historical studies are available.

An excellent forensic study was conducted by Errol Morris (2007a). Morris (2007b) argued that "photographs provide an alternative way of looking into history. Not into general history—but into a specific moment, a specific place. It is as if we have reached into the past and created a tiny peephole." Two shots, titled the "Valley of The Shadow of Death," were made April 23, 1855, by Roger Fenton during the Crimean War; taken from the same position, one showed a winding road with cannonballs on ditches and hillsides; the other showed the same view with cannonballs scattered upon the road (Morris named one "off" and the other "on"). Researchers including Susan Sontag (2003) expressed opinions about which photograph was made first; she argued that Morris had faked the shot by putting cannonballs on the road. Morris's research question was the following: Would it be possible to order these photographs based on evidence in the photographs themselves?

Alongside what historical photographs denote, there are always culturally established meanings used in the construction and subsequent "readings" of the images. The polysemic nature of images dictates that they mean different things to different persons and that the meaning of images will shift and slide over time. Morris (2007a) opposed Sontag's interpretivist reading of the two photos:

> Not surprisingly many of the canonical images of early war photography turn out to have been staged, or to have had their subjects tampered with . . . before taking the second picture—the one that is always reproduced—he oversaw the scattering of the cannonballs on the road itself.

He asked how Sontag knew that Fenton altered the landscape or, for that matter, "oversaw the scattering of the cannonballs on the road itself?" Combing through the extant writing by Fenton and his biographers, Morris found two camps: One agreed with Sontag that the photo "off" was made first; the other argued that "on" was first and explained the missing balls as having been removed to make the scene bleaker or harvested by soldiers to be fired back at the Russians. On one hand, in his postpositivist conclusion, Morris "proved" that the cannonballs had been added but that Sontag had been correct for the "wrong reasons." On the other hand, Morris was unable to disprove the larger semiotic issue that war photography is staged as a form of visual propaganda to be interpreted by viewers.

We write this chapter in the midst of the July 2014 Israeli attack on Gaza in response to Hamas rocket fire on Israel. Unlike in Fenton's day, cameras are ubiquitous, and the Internet provides a bloody traffic in war images. As the bodies pile up, one side circulates images of dead Hamas terrorists and "human shields," the other butchered innocent civilians and children. Any particular photograph may be a "peephole," but connotation, not denotation, rules. The prime minister of Israel, Netanyahu, told CNN that Hamas terrorists were using "telegenically dead" Palestinians to support their cause. Meanwhile, photographs of Hamas militants preparing to launch Qassam rockets and Palestinian smuggling tunnels are circulated as evidence of self-defense. Videos of worldwide demonstrations by both sides crowd the airways with signs and banners. The point is simple—interpretivist views dominate the discourse and traffic in war photography.

One of the aims of this chapter has been to present changing faces of VR. Technology and interdisciplinary research scenarios are encouraging VR to be more hybrid. In a 2011 TED talk, *The Birth of a Word,* MIT cognitive scientist Deb Roy (2011) presented an astonishing study about development of human linguistic skills through the example of his then newborn son. He and his team at MIT wired his house with video- and audio-recording equipment; they collected 90,000 hours of video and 140,000 hours of audio data to catch every moment of his son's life. He used a sophisticated analytical program that converted space, time, and sound into a single output, enabling him to compute and compare the data for further ethnographic evaluation. This technology enhanced visual ethnography paired with analytics to stand as an exemplar revealing possible new futures for VR. Content analysis is one such method that takes advantage of visual data synthesis and analysis software to quickly compile, sort, code, and categorize data for deep ethnographic assessments.

Content Analysis

Content analysis is one of the most widely cited methods in social sciences and media studies. It aims to be an objective, systematic, and observational method used in qualitative and quantitative research. Given the statistical nature of content analysis, it is useful in postpositivist visual research and may prove highly valuable when used in combination with other research methods. In interpretivist phenomenological research, content analysis is implemented as one of the data reduction techniques mainly to produce codes and categories. Qualitative content analysis consists of bundle of techniques for systematic text analysis, many times using sophisticated qualitative data analysis software. The criteria of reliability and validity are crucial to establish trustworthiness of qualitative research. One of the ways is to check intercoder reliability (Cohen's kappa over 0.7 should be sufficient) multiple times throughout the project for consistent reliability (Bernard, 2011). In this section, we discuss

empirical methods of content analysis for visual research, as well as its advantages, limitations, and how technological advances make for more efficient analysis of visual media.

Wilcox (1900) studied the content of 147 newspapers in the 21 largest cities in the United States in the 1890s (Bernard & Ryan, 2010). He devised a system of codes to generate 18 categories. Wilcox's methods were unclear about how he created categories, but it was the "front edge" work of what became content analysis. Bernard Berelson (1952) further developed the modern version of the method for analyzing documentary data. Since then, content analysis has developed rigorous sampling and measurement strategies.

One of the exemplary studies of content analysis of films was by Cowan and O'Brian (1990), who analyzed 56 "slasher movies" to investigate whether men or women in the films were more likely to survive. They coded 474 victims from the movies for gender and survival (Bernard, 2011). Sampling and coding are at the heart of content analysis. Variables can be inductive, evolving from open coding, or deductive, evolving from prior knowledge, also known as a priori codes. The first step is to start with a research question or hypothesis based on existing theory or prior research. Typically, a codebook is developed to ensure intercoder reliability. Content analysis allows measuring, counting, and comparing of qualitative data in scalable, quantitative forms and therefore is frequently used in mixed-methods media research.

The biggest limitation in media studies is content analysis's inherent nature to exclude implicit or latent meanings from coding operations. The method tends to focus on manifest content, breaking visual messages into elements solely by presence, absence, or frequency. While perhaps reliable, used as a mechanical process, it raises issues of validity. Hence, quantitative content analysis may not work as a single technique of inquiry but may prove to be an effective addition to a well-designed triangulation strategy.

In one of the breakthrough visual sociology studies, Parmeggiani (2009) implemented a multimethod approach combining content analysis, grounded theory, rephotography, and photo-elicitation interview techniques to explore radical changes in landscape, human activity, and values of people over 50 years in a small Italian village. What sets this study apart was his extensive exploration of DAM (Digital Asset Management) and CAQDAS (Computer-Assisted Qualitative Data Analysis). In the end, Parmeggiani came up with a list of recommendations explaining the pros and cons of each of the approaches for analyzing multidimensional data. Ability to manage, tag, and categorize enormous data sets consisting of images, video clips, audio, and texts saved time and sped up the analysis process. Over the years, computer-assisted content analysis has developed into a major industry. If one takes advantage of possibilities that new data analysis software offers, methods such as content analysis can become less intimidating and more attractive.

Concluding Thoughts

We discussed a range of approaches to VR and raised an important question: How can researchers position VR in today's interdisciplinary digitized landscapes? One of the examples of interdisciplinary digital platforms is the multimedia journal *Vectors* that promotes interdisciplinary digital scholarship and aims to create a sustained space for deep interdisciplinary collaborations among humanity scholars.[23] Technology can aid visual researchers by facilitating data set creation and the burdens of analysis for advanced ethnographic interpretation. VR effectively breaches gaps between the conventional qualitative-quantitative divide and broadens possibilities for implementation in a range of fields, including but not limited to sociology and anthropology, but also product design, architecture, visual communication, educational research, theater for social change, and humanities. The World Wide Web is adding a new dimension to visual research; moreover, the Internet's virtual image archives constitute a huge source of data that have scarcely been touched.

In sum, visual research is not new but the basis of all scientific observation, and it is not spared by a fast-changing digital world that is growing in all directions. The challenge is how to build the best possible marriage between conventional ethnographic research approaches and technological advances to produce well-rounded, robust, and implicit analytical frameworks. The fact that so many people have a camera and video recorder in their pocket is not only changing the ways that social processes, including conflict, can be viewed but also highlighting the shifting controls and screaming that researchers are not the only producers of knowledge. Recent cellphone footage has gone viral from the United States, revealing police action in ways it has rarely been seen before. While this kind of anecdotal, subject-produced video is not data per se, it will no doubt be collected and analyzed to produce generalized scientific knowledge that will benefit multiple disciplines.

Notes

1. To cover visual research in history and the humanities is far beyond the scope of this article, thus our restriction of research. There have been many good histories of visual sociology (Harper, 1988, 1998; Prosser, 1996; Stasz, 1979) and visual anthropology (Hockings, 1975; Ruby, 1995, 1996), and there is no reason to rehash that history.
2. Following Philips and Burbules (2000), we assume that postpositivism strays from its ancestors' search for "causality" and "proof" by recognizing the importance of the position of the observer and multiple correlations in place of strict causality; it remains central to the social scientific project.
3. The American Society for Indexing has a brief history of the origins and development of indices (cf. http://www.asindexing.org/about-indexing/history-of-information-retrieval/, including a discussion of indexing the World Wide Web).
4. http://hubblesite.org/newscenter/archive/releases/cosmology/distant%20galaxies/2013/39/image/a/
5. For more on draw a woman, a scientist, an engineer, see Ganesh (2011).
6. A number of software packages can aid in analyzing visual data. Some allow researchers to code video directly, rather than produce transcripts. A comparison of some of the more useful programs can be found in Bassett (2011), but software changes almost minute by minute.
7. Erving Goffman's book, *Gender Advertisements,* is a classic example of an ethnography of found images (Goffman, 1976). Jean Kilbourne's video mash-ups of advertising in the "Killing Us Softly" series follows Goffman's traces (Kilbourne, 1979) and was updated in 1987, 1999, and 2010. Sut Jhally's (1991, 2007) similar series on music videos also makes extensive use of found images and has been updated since the original in 1991.
8. Examples of releases can be found on the Internet (e.g., https://asmp.org/tutorials/forms.html#.U0gfllf3GSo). In the United States, informed consent forms usually conform to Collaborative Institutional Training Initiative (CITI) standards (e.g., https://www.citiprogram.org/).
9. The "Ken Burns effect" has become a trite bit of editing software implemented with a key stroke (cf. http://wowslider.com/jquery-slider-bar-kenburns-demo.html).
10. The project is ongoing. A brief look is available at http://www.coloradoriverstories.org/.
11. It is curious that some of the best research and visual displays of information are from the arts rather than the social science disciplines (http://unknownterritories.org/, http://sensingchange.chemheritage.org/sensing-change/art/estuarytoxi-city, http://www.klettandwolfe.com/).
12. http://www.youtube.com/watch?v=6dFbuaz130c
13. http://www.newyorkchanging.com/
14. http://www.bbc.co.uk/scotland/landscapes/rephotographs/
15. http://www.wired.com/2010/07/gallery-of-rephotography-shows-wwii-in-todays-cities/
16. To see a creepy visual display of information, log in with the account you use on your phone; the record of everywhere you've been pops up (https://maps.google.com/locationhistory/b/0).
17. Image elicitation and photovoice raise important issues governing the participation of "subjects." At issue is the status of "research subjects"

taking pictures of nonparticipants. One of the first author's students studied street youth in Lima, Peru. Despite being given cameras and instructions to photograph places and things, not people, the youth, of course, photographed many people, some engaging in unlawful activity. As a perk, the participants were given copies of the photos they made. The IRB prevented the researcher from using any of the images in which people can be recognized, while the youth posted images on the Internet (cf. Joanou, 2009).

18. Most grounded theorists are not visual researchers.
19. http://www.cerious.com/
20. http://css.dzone.com/articles/benefits-semiotics-user
21. Good examples of "universal" nonrepresentational signs include the radioactive trefoil symbol and the international sign for biohazards.
22. Cf. image 6 in http://1800recycling.com/2011/04/ten-tennis-ball-recycle-furniture-designs.
23. http://vectors.usc.edu/journal/index.php?page=Introduction

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