
In the series *Sporting*, edited by Amy Bass

Also in this series:

David L. Andrews and Michael L. Silk, eds., *Sporting and Neoliberalism: Politics, Consumption, and Culture*

David Wangerin, *Distant Corners: American Soccer's History of Missed Opportunities and Lost Causes*

Zack Furness, *One Less Car: Bicycling and the Politics of Automobility*

Michael Ezra, *Muhammad Ali: The Making of an Icon*

Thomas Hauser, *The Boxing Scene*

David Wangerin, *Soccer in a Football World: The Story of America's Forgotten Game*

Grant Farred, *Long Distance Love: A Passion for Football*

Tommie Smith, *Silent Gesture: The Autobiography of Tommie Smith*

The NFL

Critical and Cultural Perspectives

Edited by

**Thomas P. Oates and
Zack Furness**

Foreword by **Michael Oriard**

TEMPLE UNIVERSITY PRESS
PHILADELPHIA 

TEMPLE UNIVERSITY PRESS
Philadelphia, Pennsylvania 19122
www.temple.edu/tempress

Copyright © 2014 by Temple University, except for Tom Oates, "New Media and the Repackaging of NFL Fandom," reprinted, by permission, from *Sociology of Sport Journal* 26, no. 1 (March 2009): 31–49. © Human Kinetics, Inc.

Nicholas P. Ciotola, "Spignesi, Sinatra, and the Pittsburgh Steelers: Franco's Italian Army as an Expression of Ethnic Identity, 1972–1977," reprinted, by permission, from *Journal of Sport History* 27 (Summer 2000): 271–289.

Samantha King, "Offensive Lines: Sport-State Synergy in an Era of Perpetual War," reprinted, by permission, from *Cultural Studies ↔ Critical Methodologies* 8, no. 4 (November 2008): 527–539.

All rights reserved
Published 2014

Library of Congress Cataloging-in-Publication Data

The NFL: critical and cultural perspectives / edited by Thomas Patrick Oates and Zack Furness.

pages cm. — (Sporting)

Includes bibliographical references and index.

ISBN 978-1-4399-0957-7 (hardback : alk. paper) — ISBN 978-1-4399-0959-1 (e-book)

1. National Football League. 2. Football—Social aspects—United States.

3. Football—United States. I. Oates, Thomas Patrick. II. Furness, Zack.

GV955.5.N35N45 2014

796.332'6406—dc23

2014004742

♻️ The paper used in this publication meets the requirements of the American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1992

Printed in the United States of America

2 4 6 8 9 7 5 3 1

Contents

Foreword: Football as Mediated Spectacle • MICHAEL ORIARD vii

Introduction: The Political Football: Culture, Critique,
and the NFL • THOMAS P. OATES AND ZACK FURNESS 1

I Production, Promotion, and Control

1 The Greatest Game Ever Played: An NFL Origin Story
• DANIEL A. GRANO 13

2 Game Time: A History of the Managerial Authority of the Instant
Replay • DYLAN MULVIN 40

3 The Ochocinco Brand: Social Media's Impact on the NFL's
Institutional Control • JACOB DITTMER 60

4 New Media and the Repackaging of NFL Fandom
• THOMAS P. OATES 80

II Identities, Social Hierarchies, and Cultural Power

5 NFL Sex • TOBY MILLER 103

6 Football and "Ghettocentric" Logics? The NFL's Essentialist
Mobilization of Black Bodies • RONALD L. MOWER,
DAVID L. ANDREWS, AND OLIVER J. C. RICK 119

Game Time

A History of the Managerial Authority of the Instant Replay

Dylan Mulvin

*Then all that will be needed will be a mechanical umpire
of boiler iron made on the principle of the automaton chess
player of long ago.*

—Editorial, *New York Times*, May 28, 1896, p. 4

The open secret of football broadcasting is its lack of football. It is now a trope of January press coverage to dissect the formulaic broadcast and to note, helplessly, that the average three-to-four-hour televised NFL game contains somewhere between nine minutes and sixteen minutes of live action.¹ The remainder of the broadcast is composed of advertisements, shots of people standing around, and replays. It is this last feature, the instant, slow-motion, and freeze-frame replay, that I interrogate here. The replay performs an obvious, if underappreciated, role in constructing the conventional flow of images in a sports broadcast by joining together the few seconds of live playmaking and exaggerating the movements, impacts, violence, and beauty of player actions. In this sense, the replay functions at both the medium and close range of televisual flow, as suggested by Raymond Williams: The replay links words, images, and sounds in common analytic and reflective vernaculars, and it links whole segments of the program to create an affectively charged narrative.² The replay works within a system of representation to transform the sight of people standing into the appearance of capricious entertainment, and thus, it is a primary underpinning of contemporary sports broadcasting (and television broadcasting more broadly), with whole programs, networks, and a cultural industry devoted to its dissemination, sale, and analysis.

The replay is simultaneously a ubiquitous and fleeting text, utterly necessary to the aesthetic and affective techniques of contemporary sports broadcasting, yet it is usually forgotten in a matter of seconds. Not only is the replay a structuring element of football broadcasting; it has entered the adjudication

and management of the game in the form of the official review. Replay reviews are a miniature appellate system in which coaches and game officials both on the field and in an elevated booth are tasked with finding the apparent “truth” in determinable football actions.³ In this form, home viewers, through their spectator position, are reified as possessing a preferred seat of judgment. The replay viewer and, by extension, the referee are situated in a production of knowledge that is made possible only through the televising of the game. As a technique of truth determination, replay helps form an epistemological architecture constituted in and through the circulation of broadcasting texts as pieces of evidence.

In addition to its use in sports broadcasting, video replay built on a tradition of industrial and postindustrial management to become a preferred technique of streamlined, efficient, and cost-effective personnel training and evaluation. The managerial traditions that absorbed video replay used college and professional football—in coordination with television producers, electronics corporations, and the armed forces—as sites for the experimentation and demonstration of new training regimens and techniques. Two examples of the use of replay technologies demonstrate this function of football as a staging ground for the use of new media. First is the long tradition of media practices shared between American football and the U.S. armed forces. Beginning with the use of film as a training tool and expanding with the use of video, the flow of training and judgment techniques between these two institutions predates television. Second, after the NFL reinstated video replay as an official review mechanism in 1999, the league’s standard of review was adopted as a model in appellate court hearings. “Indisputable visual evidence,” the standard for overturning an on-field call, has become a benchmark for a threshold of video evidence needed to uphold or overturn a legal conviction.⁴

The history of video’s managerial, bureaucratic, militaristic, and sports-entertainment uses thus suggests four figures: the Mechanical Witness, the Mechanical Referee, the Mechanical Judge, and the Mechanical Manager.⁵ These four mechanical figures broadly encapsulate how video was described and the problems it could solve; we can accordingly understand the institutional use of video as being applied to problems of judgment, observation, and automation. The Mechanical Witness describes the ideological claims made about the video camera’s disembodied position, multiple angles of sight, constant vigilance, and instant recall. In this way it rehearses the well-weathered claims made about film as a mirror with a memory—though the ease of accessing a videotape’s short-term memory set it apart. The Mechanical Witness’s testimony—the video recording—enters into both the sports broadcast and the legal system as a final authority on events. The Mechanical Referee represents the application of the assumptions about mechanical witnessing—that it is objective, dispassionate, and desubjectified—to the problems of sport. The belief that the camera could compensate for the fallibility of the human perceptual apparatus in deciding matters of contact, boundary, and possession is one that

is at least as old as serial photography and Eadweard Muybridge's famous horse experiment. The Mechanical Judge, then, is the relocation of the Mechanical Referee's ambit to other spheres. In its most literal instance, it can mean the actual judging of guilty and not guilty—this includes automated video systems for catching speeding cars, suspicious behavior, and wanted individuals. Finally, the Mechanical Manager is both witness and judge. The manager is responsible for pattern recognition in video evidence and the improvement of performance through the use of recursive feedback. These figures are a practical shorthand for analyzing the use of video in the post-World War II period to the present. But it should not be forgotten that these four figures are in fact derived from the interactions of people, technologies, and institutions. The Mechanical Referee is a product of network broadcasts, actual referees, and the rules of a game; the Mechanical Manager represents the ideological claim that workers who see themselves on videotape will improve their performance faster and more efficiently. So while this chapter is primarily concerned with how the Mechanical Witness was transformed into the Mechanical Referee and, later, how these standards were adopted in the legal system, these figures constantly overlap and borrow from one another.

Football management, beginning in the late 1950s, was a primary location for experimenting with video as a training tool. It was also a primary site of exchange around the uses of video technology. Video began, in football, as a means of designing and evaluating plays in near real time and was transformed by the televised instant replay into a means of second-guessing the referee. In this case, a practice of witnessing and management was transposed to the practice of refereeing. With the appearance of the first televised instant replay in 1963, football as a public text became a site for the public demonstration of the utility of video in forming new techniques of aesthetic and evaluative observation. It is during this period that replay transformed again from a public form of witnessing back into a form of judging and evaluating pilots in the U.S. Air Force, using the same equipment provided to broadcasters for their televised replays. Again, a practice of public witnessing was turned into a private, institutionalized form of evaluation and management, in which the expertise of one venue (sports) was exchanged with another (military training). This is an example of what Geof Bowker calls a process of "legitimacy exchange," in which the language and rhetoric of one field is imported into another field to legitimate unorthodox or otherwise unacceptable claims.⁶ Because of the closed system of the game and the publicity of televised sports, football acted as the perfect setting to legitimate the use of video in other domains. Not least among the functions, televised sports performed in this regard was the standardization of language and protocols surrounding the video replay.

The history of replay techniques is thus co-constituted through the twin purposes of efficiency management and both aesthetic and evidentiary judgment making. Sports frequently act to join these two purposes by solidifying the commonsense appearance of visual evidence. In the simplest terms, we know a

team is doing well—performing efficaciously—because they score more points or allow fewer points to be scored. We know if they have done it well because as at-home viewers we have access to the same visual evidence as the manager or coach to make qualitative judgments. Sports highlights are thus treated "as part of a hermeneutic process of scientific discovery, which, among other things, allows the viewer to outguess the referee and see what 'really' happened."⁷ This may appear obvious now, but it was not always so. And as this chapter argues, the appearance of the replay's access to truth is an ideological claim constructed through sports as a public staging ground of truth determination.

The Replay

Instant replay first publicly appeared on December 7, 1963, fifteen days after the assassination of John F. Kennedy. In the fourth quarter of the final regular-season college football game, held between the U.S. Military Academy's Black Knights and the U.S. Naval Academy's Midshipmen, CBS's producer for the game, Tony Verna, used a modified video tape recorder (the Ampex VTR-1000) to cue, rewind, and replay a touchdown by Army's quarterback. The video recorder, normally housed at Grand Central Terminal in New York, was brought to Philadelphia for the game so that Verna could experiment with the instant replay process. When the game's play-by-play announcer was prompted that the replay was coming, he tried to forestall confusion from home viewers by shouting, "This is not live! Ladies and Gentlemen, Army did not score again."⁸

While videotape technology was designed to be imperceptible, "so that prerecorded programs were formally indistinguishable from lives ones for audiences"⁹ for viewers at home, video replay suggested that the live stream of content was susceptible to transformation. As Yvonne Spielmann writes, video began by, first, "timeshifting the flow of programming" and, second, "timeshifting the flow of images."¹⁰ This simplification refers to videotape's initial development as a means of recording television for later time zones—a process that was expensive, difficult, and unsatisfactory when it was performed using film kinescope recordings; before long, videotapes were used as a means of re-ordering single events or moments, not just blocks of programming. Through the use of replay and reediting, these events and moments became "highlights." Video was born from a desire for greater centralization of television production through the storage of content and the relatively faithful reproduction of the television signal. If this was the intended consequence of video recording, then the unintended consequences of video were those that interrupted the linear flow of time. The reflexive use of the video replay was the representative example of timeshifting the flow of images.

The replay of 1963 did not appear in a vacuum. Sports texts and events have a long history of association with formal, technical, and commercial experimentation with audiovisual media. When Leland Stanford asked Eadweard Muybridge to prove whether all four of a horse's legs left the ground while

running, he was asking a question similar to one that viewers of televised sports ask, and answer, every day: Can a person catch a ball against his helmet and fall to the ground without dropping it? The lineage of media experimentation stretches far and wide: Athletes, racehorses, and various sports-military ballistics were frequent subjects of serial photography beginning with the work of Etienne-Jules Marey and Eadweard Muybridge.¹¹ The Army-Yale football game was featured in the first all-sound newsreel in 1927; outdoor, remote television transmission debuted using the Epsom Derby as its subject; German television made its public premiere during the 1936 Berlin Olympics; the widespread adoption of closed-circuit television (CCTV) surveillance in the United Kingdom is, policy-wise, tied to the 1985 funding of new CCTV systems for use on soccer grounds; and facial recognition surveillance systems were tested by the Tampa Bay Police Department at Super Bowl XXXV, in 2001.¹² Ballistics testing, not coincidentally, was also at the center of experimentation and adoption of recording media and computational systems: Ernst Mach's instantaneous photography; Norbert Wiener's cybernetic feedback system; ENIAC, the first reprogrammable electronic computer; and magnetic tape were all either developed explicitly for or quickly adapted to the study of ballistics.¹³ The history of modern photography, analytic research, computing, and military science share a primary concern with *things in flight*. It should come as little surprise then that sport, an art of things in flight, should become a testing ground and public stage for the appearance of analytic technologies. This list is in no way exhaustive, but as the range and variety of these examples show, each one takes place at a different intersection of government, business, public, police, and engineering interests. Thus, they index the regularity with which sports act as a public staging ground for the introduction, promotion, or tweaking of new media technologies and assemblages. This history speaks to the role sport plays as a highly commercialized arena in which public and private investments in new technology are rarely questioned.

The articulation of video replay with football follows in this tradition of experimentation. As with previous technologies tested and demonstrated in the sporting arena, football was a powerful and effective means of establishing the possibilities of video as a new media technology. This results in part from sport texts and sites, as cultural endeavors, bringing together apparently closed systems, clear aesthetic-kinetic traditions, established modes of spectatorship, and ample commercial investment. Bringing together a closed system with the typical utopian claims of new media is a primary way that sports act to stage the public viability of new technologies and physical techniques. In the case of football, the use of video as an analytic training tool extended the existing use of film for similar purposes.

By the late 1960s, American sports had successfully encoded video replay in the vernacular of broadcasting. If we use current professional football as a model, we can see that the figuration of instant replay in sports includes both aesthetic and determinant judgments. Acts of aesthetic, sometimes reflective,

judgment are those in which instant replay, slow-motion, and freeze-frame video are used to embellish the football broadcast and create affectively charged montages that are incorporated in highlight packages and NFL Films. Margaret Morse and John Fiske have both written about the transformative aspects of the replay and the implied gaze of the home viewer.¹⁴ Morse argues that "the frequent repetition of the same play in slow motion marks the game on television from the outset as no longer occurring in a world subject to the laws of the ordinary linear and uni-directional time" and that "the slowness which we associate with dignity and grace transforms a world of speed and violent impact into one of dance-like beauty."¹⁵ Morse points to the often-ignored aesthetic conventions of sports broadcasting, which are usually dismissed as flagrantly sensational. A dismissal of the reflective, aesthetic appreciation of televised sport, however, is entwined in the dynamics of class and taste that work to socially distance, say, contact sport from ballet.¹⁶

Replays are also used to make *determinant* judgments on the basis of what are considered empirical facts.¹⁷ Video replay as an empirical instrument has become a preferred mode for the judgment of action, and the home viewer's spectatorial position has been reified as the preferred seat of judgment. This is evidenced in the remaking of the stadium to fit the normative expectations of at-home viewership: including larger and higher-definition screens and in some cases sound recorded from field level and rebroadcast through surround-sound apparatus. The process of reification is further evidenced in the widespread use of replay in the officiating of the game—and when these uses are prohibited, the frequent controversies surrounding the lack of replay as the final authoritative version of events. Though the standards are fluid, replay use is limited in the game to judgments of boundary, possession, and time infractions and not permitted for calls like "unnecessary roughness," "unsportsmanlike conduct," or (a personal favorite) the catch-all "palpably unfair act."¹⁸ However, video is increasingly used in adjudicating behavioral infractions in the extrajudicial sphere of sports management. In the NFL the commissioner's office relies on slow-motion, multiangled video replay to determine intent on an illegal hit. In this way, the surveillance of the football field is offered as a response to the heightened awareness of player injuries, and video replay becomes a managerial tool—a case file—for docking pay and suspending players. Relatedly, researchers looking into the effects of repeated cranial impacts on amateur and professional athletes increasingly rely on video playback synchronized with instrument measurement as evidence of concussive events.¹⁹ In each of these cases game logic, corporate management, and scientific research rely on overlapping yet contingent logics of what counts as determinable action. Throughout the 1960s, the institutional use of video technology created the conditions in which the reliance on video evidence as the ultimate arbiter became a matter of common sense across social spheres. As a site of experimentation, adoption, and public figuration, American football at the college and professional levels was integral to the way the game's managers and broadcasters struggled to

instrumentalize video as not only a means of aesthetic elaboration but a highly developed, codified, and commonsense means of judgment, knowledge formation, and labor management. To better understand how a putative broadcasting technique becomes a technology adapted to the demands of large-scale institutions, I turn now to the overlapping history of film and video training in American military operations and football programs, beginning with the use of film. I then turn to the appearance of the NFL's video review standard as a judicial standard for the evaluation of visual evidence.

From Football Field to Battlefield: Motion Pictures, Video Replay, and American Football

The early use of motion pictures in football reveals an overlap of fictional, documentary, and instructional texts. While college and professional football teams were early adopters of film as an instructional method, so-called grid films flooded theatres by 1926, when every Hollywood studio produced a football feature, some of which used actual football players as actors and mixed fictional content with newsreel footage.²⁰ The public was flooded with football features, and by November 1926 the *Chicago Tribune* was lamenting the number of grid films produced.²¹ Grid films were public texts, circulating for audience amusement and sometimes pedagogical purposes. But film was also readily used as a training tool by team management. As early as October 1915, the Princeton University football team was filming its players' scrimmages to "build up team work as well as individual play by the use of films."²² In the same week, a didactic football film produced by Universal showed an audience in Atlanta "how to play football."²³ By 1923 Knute Rockne, the Notre Dame football coach, was described as having a film-based approach to instruction and a "successful system of building football machines."²⁴ In 1927 Chick Meehan, coach of the New York University Violets, produced a film, *Football Sense*, that showed "in normal and slow motion pictures the running off of various plays."²⁵ By 1930 Rockne was producing a series of pedagogical actualities that were meant for instructing young football players and carried titles like *The Last Yard*, *The Hidden Ball*, and *Two Minutes to Go*.²⁶ By 1939 instructional baseball and football films were available for purchase from *American Boy* magazine, which coaches supplemented with additional footage in clinics for young players.²⁷

Throughout the 1920s and 1930s film was widely established as an instructional tool in sports management. In some cases instructional films were public events, foreshadowing the public life of sports analysis to come. In addition to making football instruction into a public event, these grid films demonstrated the applicability of analytic techniques like slow motion to the domain of sport instruction and championed them as elevated modes of access. Other technologies were also tested and imported into football instruction during this period. For instance, at the University of Pennsylvania Bert Bell (then an assistant

coach) used a TelAutograph—a long-distance writing device and precursor to the Telestrator—to communicate opponents' formations from the press box to the sideline.²⁸ It was during the 1940s, however, that football changed from a sphere of experimentation to a dominant site for the use of recording media in instruction and determinant judgment making. In 1941 the New York Giants and Green Bay Packers employed game film "in hopes to correct [each] squad's errors,"²⁹ and a year later, the studious use of game films increasingly appeared in press coverage of college and professional teams.³⁰ In 1942 the Chicago Cardinals organized a special screening of their own game film from a previous week's matchup against the Green Bay Packers. In an attempt to convince the city's newspaper writers that a touchdown had been illegitimate, they claimed that a referee had signaled an end to the play with a whistle—in audible on the film, but they tried to prove it occurred through close scrutiny of bodily gestures.³¹

A syndicated column by Whitney Martin from the same period discusses the ascent of film analysis in settling disputes on the football field. Of "the man with the mechanical eye" he writes:

After considerable gumshoe work we finally have uncovered football's 12th man. He's the movie cameraman, and how they ever determined who won games before he appeared on the scene is more than we can figure out. This mechanical umpire perches precariously on top of press coops or in special little dens, and by simply turning a crank not only creates more arguments than a tax bill, but actually wins and loses games.³²

Martin continues by cataloguing the many cases in which films were used to reverse referees' decisions and teams' victories during the week following the game: "[The coaches] have the films run backwards and forwards and crossways in an effort to pick out flaws in the play, or in the officials."³³ Game films added new textuality to the history of film as a persuasive tool as temporal manipulation turned the documentation of a football game into an analytic event. Timeshifting, in other words, became its own institutionalized form of exhibition, a technological means of overturning the results on the field and disturbing the dominion of the referee's interpretive command of events. Martin's article is not remarkable because it was singular for the time (it is not) but because of the banality with which it treats the use of the "mechanical umpire." By describing how normalized the practices of film recording and analysis had become—"Your big-time coach nowadays spends more time at the movies than he does at home"—Martin demonstrates that the patterns of media production that are associated with video as an analytic tool were entirely ordinary for film use by the beginning of the 1940s. This ordinariness made football an obvious testing ground for new forms of visual analysis, which was clearest in the growing affiliation of sports management and military management during World War II and the postwar period. Videotape did not replace film because of any

linear progress of technological development; instead it was used to extend the patterns of use and adoption that were maintained through the heavy investment in sports management and military development. The history of instant replay is therefore best viewed as an extension of existing political articulations of technological solutions to managerial problems.

Visual Authority

By the early 1940s, game films had taken on the authority of final arbiters of truth, and textual techniques associated with the analytic potentials of video were becoming a part of the public legibility and legitimacy of game films. “Backwards, forwards, and crossways,” as Martin describes coaches’ film use, suggests a high level of interaction with the medium as an accessible text and indicates a prototypical kind of random access to nonserial events. It also speaks to an ideological inclination toward a bounty of recorded media, permitting a circumstance in which the desired piece of information is available with precise manipulation of time and material. “Truth” determination in this case is a concept produced between recording material, operator, judge, and original performance. The negotiation of these parties is subsequently subject to the relations of power and authority: The referee’s power over the field, the coach’s appeal to technological redetermination, and the newspaper reporter’s channels of persuasion are all implicated in the dispute over what actually happened. Outside the playing field, however, the authority attributed to the “mechanical eye” and the “mechanical umpire” was attributed to the use of video in other spheres in a simple act of legitimacy exchange. By the mid-1960s everything from traffic police to sewing factories to navy command-and-control systems were described as using video’s instant replay abilities to observe and analyze drivers, workers, and soldiers to correct errors and improve the efficiency of their performance. The transition from film to video shows a shift in how mediated instruction is discussed. Most forms of film-based analysis were used to produce model examples of player movement or were used post facto to prove how an event unfolded. The entrance of video is closely tied to the shift to television coverage of football. But behind-the-scenes video was immediately adopted as a protocypbernetic technology, a means of stamping out errors in player and team performance. Television coverage provided the language and currency of the video apparatus, and team training provided the methods that were actually adopted by other organizations.

The well-weathered dictum that “sport is war” is a shorthand that succeeds in both elevating the stakes of sport and trivializing the consequences of military action. Much has already been written on exactly how sport and war coverage sound and look alike and how they now coconstitute one and the same synergistic enterprise.³⁴ Instant replay is integral in the discursive construction of the sport-war nexus. In a recital of the possible comparisons of sport and war, Samantha King suggests one similarity exists in the televisual production

of war, which comes to resemble instant-replay-laden football broadcasts.³⁵ Like grid films, this is the public life of the sports replay; it is a genre technique that is so widely comprehensible that it has become a model mode of address for any large-scale televised event that seeks to combine affectively charged live footage with audiovisual analysis. However, there is a second story of the ways that the military and football industries work in lockstep. Throughout the twentieth century a two-way flow persisted between football and military operations for the exchange of audiovisual techniques for training and judging individuals, with football frequently acting as a testing ground and stage for the efficacious demonstration of new media technologies. Leading up to the Vietnam War, video techniques of instant replay were borrowed from football for military operations.

The exchange of video-based forms of training between football and the military is predated by similar exchanges of film techniques. The link between mediated football training and army training became explicit in 1940, when the *New York Times* published “Army Uses Football Idea, Guides Trainees by Films.” The article was and is mostly remarkable for the observation highlighted in its title: that the concept of training by film moved *from* football *to* the army. This causal path is supported by the assertion that film instruction was “a training method long used by advanced football coaches to facilitate the drilling of . . . [the military’s] growing forces.”³⁶ Although this article is concerned only with instructional films—and not analytic film use—it speaks to the overlapping flows of mediated training methods during this period. Sound and motion pictures made using the football method showed “every phase of training” and were “available to all units,” and thus, the techniques used in the army not only were attributed to a genesis in football training techniques but signaled a widespread audiovisual standardization of training methodology across the army.³⁷ One article is perhaps not enough to prove that the army drew its film techniques from football, but the overlapping practices were common enough to support the claim that at least the two were inextricably linked in their instructional methods by the end of World War II.

The first documented use of video replay as a feedback and training system occurred in 1957—and it occurred on the football field. The NFL’s Los Angeles Rams experimented with video replay in a game against the San Francisco 49ers, with equipment provided by the Ampex Corporation.³⁸ The system was used to make live adjustments and was consulted by coaches and players alike. Other college football programs adopted the same systems, but they were quickly banned, believed to give too great of an advantage to large schools with the funding to support expensive video analytics.³⁹ In Ampex’s promotional materials and designs for new video technologies, football regularly served as the foremost example of the possibilities of replay. Advertising photographs feature time-lapse portrayals of football movements, echoing the time-motion studies of the early twentieth century, while pamphlets and manuals for new video equipment almost always suggested offices, hospitals, classrooms, and

homes as sites for replay's application through reference to the football replay as an aesthetic *and* self-improving instrument.

Simultaneously, the U.S. Navy and Ampex developed the Pilot Landing Aid Television (PLAT) system in the late 1950s and installed it on the USS *Ticonderoga* in 1961 and on every battle cruiser in the navy by 1963—before video replay had ever appeared on television.⁴⁰ The PLAT system, still in use today, records every plane landing for immediate review. The PLAT is one of the first crystallizations of video recording as an instant feedback system. Widely viewed as a success, PLAT was the subject of a report from the Third Armed Forces Television Conference in October 1962 that states that it had reduced pilot error, reduced the misattribution of mechanical failure to human failure, and allowed comprehensive monitoring of landings from the flight deck, the captain's bridge, and the pilots' ready room. The report also describes the standardized set of cameras, angles, and CCTV equipment necessary to operate a PLAT system.⁴¹ An operator sits in a booth and chooses the different angles for the approach and the landing, records them to tape, and replays them to the pilots in the ready room. In short, the flight deck of the battle cruiser operates homologously to the football field, as it is broadcast to the living room of home viewers. The armed forces were quick to recognize the economic and bureaucratic pragmatism of using replay television: Dismissing the cumbersome use of kinescope recordings, the report summarizes, "Video tape offers probably the most striking new way of achieving the goal of providing *economical, standardized, effective* instruction within and among the three services."⁴²

Yet when Paul Nitze, the secretary of the navy, introduced satellite broadcasting of the Vietnam War in 1966, he expressed fears that the technology and, more particularly, the liveness of the images, would be too shocking for home viewers. Nitze imagined that it might not be in the public's interest to know exactly what was happening *now*:

"Today it is technically feasible to provide live television coverage of a strike against the Communists in Viet Nam from a 7th fleet carrier in the South China Sea," he said. "It is also technically feasible that some missions can be covered live." "But, significant and necessary to balanced reporting is whether or not society is ready for it [on-the-scene coverage]," Nitze [said]. . . . Nitze praised the progress of radio and television news coverage and said that the navy has adopted some electronic techniques, such as instant replays, for its own use.⁴³

Nitze's comments were widely reported and the fear of sports-style war coverage was skewered by Art Buchwald a week after Nitze's comments: "Look at those huts go up in flames. Now let's see that on the stop action instant replay camera again."⁴⁴ Broadcasting, replay technology, liveness, and at-home viewership all converged in a fear that simultaneity and repetition in television broadcasting were contributing to the domestication of violence. It is a familiar

refrain of popular claims about media effects that repetition will inure an audience to shocking imagery. In the coverage of the Vietnam War such a claim was extended to include the notion that "liveness," as a televised experience, was somehow a more severe mode in which to experience violence. The instant replay symbolized the combination of the twin fears of liveness and repetition in a single idea by suggesting that the most shocking elements of the Vietnam War could be captured and repeated ad infinitum like a particularly hard tackle in a football game. Yet in the same breath that Nitze offers a hint of these fears, he indicates that instant replay is a perfectly germane technology for naval training.

During the height of the Vietnam War, the usefulness of video replay was once again the focus of the armed forces' methods for economical instruction. During appropriations hearings in 1969, Dr. William Lehmann, head of the Air Force laboratories, responded to a query on the amount spent on the Behavioral and Social Sciences Program with this justification:

For example, we have done a simple little thing like putting a TV camera in a cockpit looking down on a pilot and his instruments so the TV camera sees what the pilot sees while he is going through pilot training. After he has gone through a maneuver he comes back on the ground and he gets instant replay. He sits down with his instructor and the instructor, in a calmer environment says, "Here is what you did. That was wrong. That was right."⁴⁵

Between 1961 and 1969, instant replay went from a technique for evaluating landings to a fully incorporated part of the cockpit, while camera placement shifted from the multiple perspectives of the flight deck to the situated perspective of the pilot. The trend is thus from the establishment of a standardized system of instruction (the PLAT) to an atomized, personalized form of instant error correction. The use of replay in sport followed the same trajectory. Following from the grid films of the 1920s–1950s, used to elucidate and contest events, video individualized the training regimen of the sports bureaucracy through instant feedback and recursive systematization.

Under the Hood: Video Replay Is Enshrined in Law

Regular viewers of contemporary football know that during an official video review the referee's task is to find "indisputable visual evidence" that proves the original call on the field was faulty. In this way the NFL review process roughly encapsulates the basic elements of the appellate court process.⁴⁶ Appellate judges, like NFL referees, can overturn a previous court's decisions only when a standard of review is met. Appellate decisions concern either matters of law or matters of fact. While little deference is given to a previous court's ruling on matters of law, greater deference is given to their findings of fact.⁴⁷ Similarly, an NFL referee respects the original official's ruling first and foremost—and in

fact he lacks the ability to overturn a ruling on a matter of faulty procedure, say, if a whistle was blown too early. These similarities have been noted by several commentators and most recently by Diarmuid O'Scannlain, a judge of the U.S. Court of Appeals for the Ninth Circuit: "The NFL has a sophisticated process of instant replay video review similar to our legal system, and football referees face many of the same procedural and technical issues of the sort confronted by federal judges. The comparisons can be most revealing."⁴⁸ Sports metaphors can be useful tactics for obfuscating more complex issues of law and regulation. We need look no further than the 2005 confirmation hearings for Supreme Court justice John Roberts, who claimed that his approach to the law was that of an umpire merely calling "balls and strikes."⁴⁹ But the metaphor has become real in the case of instant replay.

In the 2000 Texas Court of Criminal Appeals case of *Carmouche v. State*, involving the police search of a suspect's car, the search was captured by the police officer's car-mounted video camera. In overturning the lower court's ruling that the officer had just cause for conducting the search, the court ruled that there was "indisputable visual evidence contradicting essential portions of [the officer's] testimony."⁵⁰ The evidence was enough to overcome the normal deference given to a lower court's finding of fact, and it enshrined in law the NFL's standard of review as a precedent for the use of video evidence. To reiterate, when the court was faced with the challenge of justifying an unorthodox ruling and of overstepping the normal bounds of its purview it legitimated its decision by drawing on the NFL. This is not only a classic example of legitimacy exchange, as per Bowker, but the highest possible elevation of the system of judgment and the hermeneutic certainty associated with football judgment making.

Video cameras entered courtrooms in the late 1960s, and video evidence was incorporated much more smoothly than film ever was.⁵¹ For fifty years, video footage has been used when there were not enough court stenographers, and video has long been the standard format for recording pretrial depositions. But *Carmouche*, and the attention that the ruling brought, point to another change not captured by the adoption of video technology as a solution to bureaucratic problems. The seepage of review standards from the NFL to the legal sphere occurred when the system of sports judgment came to appear self-evidently valid enough to serve as a model for other institutions. In other words, in search of a system of visual analysis that works, Texas courts settled on the NFL's—a system that has existed in its current incarnation only since 1999. Was this choice made because of the familiarity of the review system in the NFL or because the system seems fair? Or was it because the practices of visual evidence review are so publicly scrutinized in the NFL that all forms of video analysis necessarily draw comparison to televised replay? The historical evidence suggests that it is some combination of all three. *Carmouche* monumentalized the public role of the football replay as a dominant mode of analyzing and judging audiovisual evidence. In this way, the Texas court's ruling

neatly brackets the 1963 introduction of video replay in a football game by elevating the mechanical witness above all else and calling on the language and evidentiary threshold of the NFL to do so.

In the opening pages of *The Principles of Scientific Management*, Frederick Winslow Taylor tenders a comparison between hard labor and sports meant to clarify the argument of his book and obviate criticism of his management methods:

The English and American peoples are the greatest sportsmen in the world. Whenever an American workman plays baseball, or an English workman plays cricket, it is safe to say that he strains every nerve to secure victory for his side. He does his very best to make the largest possible number of runs. The universal sentiment is so strong that any man who fails to give out all there is in him in sports is branded as a "quitter," and treated with contempt by those who are around him.

When the same workman returns to work on the following day, instead of using every effort to turn out the largest possible amount of work, in a majority of the cases this man deliberately plans to do as little as he safely can—to turn out far less work than he is well able to do—in many instances to do not more than one-third to one-half of a proper day's work. And in fact if he were to do his best to turn out his largest possible day's work he would be abused by his fellow-workers for so doing, even more than if he had proved himself a "quitter" in sport.⁵²

This statement is noteworthy for two reasons. First, it captures the frustration that Taylor felt throughout his late career in getting his scientific method adopted; despite his joining of a supposedly rigorous supervisory technique with an individualized pay structure, he failed time and again to account for worker resistance to his new designs.⁵³ Second, it points to a belief that has come to resemble truth: that sports are a primary site of pure human effort. This second commonplace has implied, at different times, that sports develop from unadulterated meritocracy, and more importantly, that management systems can take root and function structurally, systematically, and freely in sports. Such a belief depends on the assumption that worker or player resistance is neutralized by the pursuit of victory. This belief is also a structuring force in how we talk about knowledge formation and judgment making in high-level competitive sports. Histories of video often refer to the videotaped beating of Rodney King as a seminal breaking point in the reputability of video evidence. But football has never faced such a point. If anything, the pursuit of greater precision in judgment making—an effect of the "pure effort" of the athlete and referee—on the field of play has accelerated at the same time that video evidence has lost authority in the news media. Sports adjudication thus remains a refuge of hermeneutic certainty, which is supported by the *Carmouche* decision.

Epilogue

When discussing the use of video technology in sport one issue less apparent than others is that replay and video storage more broadly are always championed foremost for their cost-saving potential. Despite the onerous cost of investing, running, and maintaining video equipment, the potential to automate and standardize training and improvement through audiovisual feedback outweighs the expenditure. This view evokes the ideological presupposition that through the machine mediation of labor, workers need only provide the motive power. And in this case, the video assemblage provides feedback and control.⁵⁴ Video replay promised the idealized labor of other time-motion media but did so in a live, local environment. That is, while video storage allowed for the creation of ideal-type recordings, each person, in confronting the replay, is positioned as a self-correcting and improving organism.

The early twentieth-century boom in industrial development was propelled by the allocation of human resources and massive funding for behavioral, psychological, and physiological research during the wartime and postwar periods. The first half of the twentieth century spans from scientific management, time-motion studies, and streamlined production methods to the psychological study of worker satisfaction. By the time video recording appeared, efficiency and productivity studies had become a commonsense paradigm for the justification of investment in new technology and the reshaping, reconfiguring, and outright dismissal of existing occupations. Accordingly, other than sports broadcasting, the most common use of video replay was its application to instructional problems. The Ampex Corporation spread a widely cited figure in 1968 that 60 percent of all videotape recorders were being used in formal education, most notably as a form of self-instruction whereby the camera-recorder-monitor assemblage replaced or extended the purview of the instructor.⁵⁵ Yet the dominant understanding of video playback practices came from the sports arena and the instant replay. So while sports applications have always been a minority application of video recording, they nonetheless dominate the ways people talk about video as an analytic tool and the projects for which video is suggested as a solution.

Noting that sports were a minority practice of video use in the 1960s is not to undervalue their constitutive role in imagining the potential applications of video technology. In fact, quite the opposite is true. It is *because* sports were such a small fraction of the overall use of video that we should understand their constitutive function as a product of other, more powerful forces. Sports have long played an unacknowledged role in determining the boundaries of media standards and applications. For example, early film reels were just long enough to fit a single round of boxing, and the first VHS tapes, made by American and Japanese manufacturers, were made to fit the average length of a football game.⁵⁶ Format standards, like the video replay, are artifacts of the currency and commercial force that sports inevitably exert on the conventions

of broadcasting and media production. This is integral to the symbolic role that football performed in establishing the bureaucratic, industrial, and military potential for recursive video playback in the 1960s.

In a widely circulated article questioning the future of American football, the current co-owner of the Pittsburgh Steelers, Art Rooney II, is quoted as saying, "There's no question that [high definition] television is remarkable. . . . But it also, at times, may give us a view of something that we didn't always have before, and in some cases it may be shocking to people, I guess."⁵⁷ Rooney is referring to the heightened level of publicity in the last decade surrounding the effects of playing football on the human brain. Rooney's suggestion, which is not unique among those involved in this debate, is that high-definition television may be responsible for this newfound interest in concussive impacts.⁵⁸ That Rooney should now occupy a strict constructivist position on the issue of video technology should come as no surprise. As the political articulations of video have shifted, replay no longer serves a singular purpose of training and evaluating individual performance; instead, by allying them with neurological science, replays take on a new currency. Thus, the politically maintained polysemy of the replay is such that a massive hit can signify vastly different meanings for different audiences: an effective tackle, proper technique, a penalty, a concussion, potential brain damage, and a punishable offense enforced by the office of the commissioner.

For the American history of video replay to develop the way that it did, twin moves were necessary: On one front, sports broadcasting, and football in particular, acted as a site for the public representation and popularization of video replay as a means of truth determination. Simultaneously, and behind the scenes, video was put to the test in the training of athletes, using the systematic management of teams, leagues, and associations as a way of testing the implementation of video training technologies and techniques. The successful spread of both video-based, football-style training and the replay as a broadcasting technique is evident in its popularity and signal representation in court systems today, the incorporation of the replay as the ultimate source of evidence on the field of play, and its pervasive adoption in military, industrial, and personal applications from the 1960s onward. It remains important to think about the ways that cultural texts such as the replay simultaneously act as public texts for circulation and private, bureaucratic documents. These texts are often fleeting, but the apparatus of their production leaves its marks. Instant replay training imported from the field of play to the navy served as an integral part of training pilots in the Vietnam War. The NFL's replay review system is derisible until it is enshrined in jurisprudence. Practices of media production in and around the management and broadcasting of sports contribute to contemporary understandings of objective truth, production of scientific research, development of disciplinary regimes, and codification of legal regulations. A focus on how such media practices are maintained through time and the ways they reach outside the boundaries of sport will make us more attentive to the cultural and political

dimensions of the work that players, referees, coaches, and managers undertake as well as our own situated positions as observers and judges.

NOTES

1. For example, see Richard Sandomir, "By the Numbers, the College Bowl Games Have Less Action," *New York Times*, January 7, 2004, p. D2, and David Biderman, "11 Minutes of Action," *Wall Street Journal*, January 15, 2010, p. W1. This is also mentioned in a description of the NFL broadcasters' wider production methods in Arthur A. Raney and Jennings Bryant, *Handbook of Sports and Media* (Mahwah, NJ: L. Erlbaum, 2006), 85.
2. Raymond Williams, *Television: Technology and Cultural Form* (New York: Schocken Books, 1974).
3. For a greater elucidation of the appellate comparison, see Chad M. Oldfather and Matthew M. Fernholz, "Comparative Procedure on a Sunday Afternoon: Instant Replay in the NFL as a Process of Appellate Review," *Indiana Law Review* 43, no. 1 (2009): 45–78.
4. *Carmouche v. State*, 10 S.W.3d 323, 331 (Tex. Crim. App. 2000).
5. Credit is owed to Louis-Georges Schwartz for the name "Mechanical Witness." As the epigraph to this chapter indicates, however, the dream of a mechanical umpire is at least as old as 1896.
6. Geof Bowker, "How to Be Universal: Some Cybernetic Strategies, 1943–70," *Social Studies of Science* 23, no. 1 (1993): 116.
7. Margaret Morse, "Sport on Television: Replay and Display," in *Regarding Television: Critical Approaches—An Anthology*, ed. E. Ann Kaplan (Frederick, MD: University Publications of America, 1983), 49.
8. Tony Verna, *Instant Replay: The Day That Changed Sports Forever* (Beverly Hills, CA: Creative Book Publishers International, 2008), 14.
9. Lucas Hilderbrand, *Inherent Vice: Bootleg Histories of Videotape and Copyright* (Durham, NC: Duke University Press, 2009), 38.
10. Credit is due to Yvonne Spielmann for this handy simplification of the turn in video's early development, from broadcast technology to replay technology. Yvonne Spielmann, *Video: The Reflexive Medium*, trans. Anja Welle and Stan Jones (Cambridge, MA: MIT Press, 2008), 251.
11. François Dagognet, *Etienne-Jules Marey: A Passion for the Trace* (New York: Zone Books, 1992); Marta Braun, *Picturing Time: The Work of Etienne-Jules Marey (1830–1904)* (Chicago: University of Chicago Press, 1992).
12. Ray Gamache, "Genealogy of the Sportscast Highlight Form: From Peep Show to Projection to Hot Processor," *Journal of Sports Media* 5, no. 2 (Fall 2010): 95; Albert Abramson, *The History of Television, 1880 to 1941* (Jefferson, NC: McFarland, 1987), 166. The Epsom Derby had also been the subject of a film in 1896 that was rushed through development in an attempt to preserve something of its currency. Gamache, "Genealogy of the Sportscast," 93; Monika Elsner, Thomas Müller, and Peter Spangenberg, "The Early History of German Television: The Slow Development of a Fast Medium," *Historical Journal of Film, Radio and Television* 10, no. 2 (1990): 193–219; Kelly Gates, *Our Biometric Future: Facial Recognition Technology and the Culture of Surveillance* (New York: New York University Press, 2011), 75.
13. Josef Maria Eder, *History of Photography* (New York: Dover, 1978), 524–528; Peter Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," *Critical Inquiry* 21, no. 1 (1994): 256; Paul E. Ceruzzi, *A History of Modern Computing*

(London: MIT Press, 2003); Ampex Corporation, *Annual Report, 1963*, Series 2, Box 16, Ampex Corporation records, M1230, Department of Special Collections, Stanford University Libraries, Stanford, CA. Friedrich Kittler is fond of noting the cooperative development of media and war technologies. In the case of television, see Friedrich A. Kittler, *Optical Media: Berlin Lectures 1999* (Cambridge: Polity, 2010), 217.

14. Morse, "Sport on Television," 48–52; John Fiske, *Television Culture*, 2nd ed. (London: Routledge, 2011).
15. Morse, "Sport on Television," 49.
16. Pierre Bourdieu has written rather extensively on the inseparability of sport and the larger social whole, with particular attention paid to the class treatment of bodily proximity. Pierre Bourdieu, "Program for a Sociology of Sport," *Sociology of Sport Journal* 5, no. 2 (1988): 153–161.
17. Some readers will recognize these two categories as those used by Immanuel Kant in *The Critique of the Power of Judgment*. While my reading of Kant is through the more recent Guyer and Matthews translation, I have not retained their translations of *bestimmend* as "determining" and *reflectirend* as "reflecting." Immanuel Kant, *Critique of the Power of Judgment*, trans. Paul Guyer and Eric Matthews (Cambridge: Cambridge University Press, 2000).
18. Palpably Unfair Act is an NFL rule available to officials if no other rule applies to an infraction or event on the field—say, a fan's interference in the play. It is the ultimate discretionary option for the referee and the only one that is explicitly contingent on the referee's subjective intuition.
19. Video playback was used to analyze injuries as early as the 1970s, while current research into cranial impacts uses helmet-kinematics-matched game video to compare visual evidence with data readings of head direction, velocity, and impact. See, for instance, David C. Viano, Ira R. Casson, and Elliot J. Pellman, "Concussion in Professional Football: Biomechanics of the Struck Player, Part 14," *Neurosurgery* 61, no. 2 (2007): 313–328.
20. Dyer Braven, "Deluge of Football Films to Hit Public This Fall," *Los Angeles Times*, July 25, 1926, p. A2. In fact, by 1937, the film industry had become a top destination for out-of-work and retired football players. Harold Heffernan, "Grid Heroes Rounded up for Movies," *Hartford (Connecticut) Courant*, September 25, 1937, p. 7.
21. Tinee Mae, "Here's Another of the College Football Films," *Chicago Daily Tribune*, November 4, 1926, p. 25.
22. "Films to Aid Coach Rush," *New York Times*, October 15, 1915, p. 12.
23. "Brickley, of Harvard, in Football Film," *Atlanta Constitution*, October 10, 1915, p. A11.
24. "Knut Rockne Will Open Coaching School," *Washington Post*, January 28, 1923, p. 53.
25. "Football Film Praised," *New York Times*, September 29, 1927, p. 23.
26. "Before the Cameras and the Microphones," *New York Times*, August 31, 1930, p. x5.
27. "Iowa State Plans for Baseball and Football Clinics," *Christian Science Monitor*, March 10, 1939, p. 12.
28. Michael MacCambridge, *America's Game: The Epic Story of How Pro Football Captured a Nation* (New York: Random House, 2004).
29. "End of Fumbling Sought by Owen," *New York Times*, October 15, 1941, p. 1.
30. Edward Prell, "Bears Go into Movie Huddle for Redskins," *Chicago Daily Tribune*, December 8, 1942, p. 31.

31. "Grid Films Put Referee on the Spot," *Hartford (Connecticut) Courant*, October 7, 1942, p. 15.
32. Whitney Martin, "Football Films Cause Arguments and Often Win or Lose Battles," *Hartford (Connecticut) Courant*, November 17, 1941, p. 12.
33. Ibid.
34. Sue Jansen and Don Sabo argue, for instance, that the mixing of sport and war metaphors during the 1991 Gulf War played a "historically unique" role in understanding the events. "Sport/war tropes are crucial rhetorical resources," they write, "for mobilizing the patriarchal values that construct, mediate, maintain, and, when necessary, reform or repair hegemonic forms of masculinity and femininity." Sue Curry Jansen and Don Sabo, "The Sport/War Metaphor: Hegemonic Masculinity, the Persian Gulf War, and the New World Order," *Sociology of Sport Journal* 11, no. 1 (1994): 1.
35. Samantha King, "Offensive Lines: Sport-State Synergy in an Era of Perpetual War," *Cultural Studies ↔ Critical Methodologies* 8, no. 4 (2008): 527–539.
36. "Army Uses Football Idea, Guides Trainees by Films," *New York Times*, December 8, 1940, p. 17.
37. Ibid.
38. "Videotape Replay: Football's New Brain-Picker," *New York Times*, December 26, 1965; MacCambridge, *America's Game*, 204.
39. "NCAA Bans Electronic Coaching Aids," *Hartford (Connecticut) Courant*, January 19, 1967.
40. Ampex Corporation, *Annual Report, 1963*.
41. Office of the Chief Signal Officer, Audio-Visual Communications Directorate, "A Report: The Third Armed Forces Television Conference, Fort Lee, Virginia, 17–19 October 1962," April 1963, available at <http://www.dtic.mil/dtic/tr/fulltext/u2/405785.pdf>.
42. Ibid., 15 (emphasis added).
43. "Navy's Chief Hails TV Aim: Instant News," *Chicago Tribune*, September 30, 1966, p. B14.
44. Art Buchwald, "Capitol Punishment: Live and in Color," *Washington Post*, October 6, 1966, p. A25.
45. House of Representatives, Committee on Appropriations, Subcommittee on Department of Defense, "Department of Defense Appropriations for 1970, Part 4: Research, Development, Test, and Evaluation," 91st Cong. (1969).
46. Oldfather and Fernholz, "Comparative Procedure on a Sunday Afternoon"; Diarmuid F. O'Scannlain, "The Role of the Federal Judge under the Constitution: Some Perspectives from the Ninth Circuit," *Harvard Journal of Law and Public Policy* 33, no. 3 (2010): 963–986.
47. Oldfather and Fernholz, "Comparative Procedure on a Sunday Afternoon."
48. O'Scannlain, "The Role of the Federal Judge under the Constitution," 971.
49. *Confirmation Hearing on the Nomination of John G. Roberts, Jr. to Be Chief Justice of the United States: Hearing Before the Committee on the Judiciary, United States Senate*, 109th Cong. (September 12–15, 2005), 56.
50. *Carmouche v. State*.
51. Louis Georges Schwartz, *Mechanical Witness: A History of Motion Picture Evidence in U.S. Courts* (Oxford: Oxford University Press, 2009).
52. Frederick Winslow Taylor, *The Principles of Scientific Management* (New York: Harper and Brothers, 1911), 3.

53. As David Noble notes, Taylor's system was fully adopted in only two factories and was banned from all military and government operations from 1916 to 1949. The "man problem," as Noble calls it, plagued the engineers of Taylor's era, who, having stripped all craftwork from labor, sought to create new reasons for workers to feel motivated. David F. Noble, *America by Design: Science, Technology, and the Rise of Corporate Capitalism* (Oxford: Oxford University Press, 1977), 262.
54. This view is, of course, offered by Karl Marx in chapter 15 of *Capital*. Karl Marx, *Capital: A Critique of Political Economy*, vol. 1, trans. Ben Fowkes (London: Penguin Classics, 1990), 492–639.
55. See, for example, "Fast Growth Shown by Videotape Market," *Chicago Tribune*, September 23, 1968, p. C7.
56. Dan Streible, *Fight Pictures: A History of Boxing and Early Cinema* (Berkeley: University of California Press, 2008); Hiroshi Sugaya, "Consumer Video Recorders," in *Magnetic Recording: The First 100 Years*, ed. Eric D. Daniel, C. Denis Mee, and Mark H. Clark (New York: IEEE Press, 1999), 182–200.
57. Ben McGrath, "Does Football Have a Future?" *New Yorker* 86, no. 46 (2011): 45.
58. Facing comparable issues, the National Hockey League recently promised to invest in better video equipment to fight concussions, a solution that seems likely to work only if players watch television instead of playing the sport.