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## From Lab to Classroom

### *Animal Testing and Educational Film*

In a review for the September 1952 edition of the *Psychological Bulletin*, educational psychologist Tracy S. Kendler extolled the teaching value of *Motivation and Reward in Learning*.<sup>1</sup> She suggests that the film be thought of as akin to a lab session, except without “the fumbling and presenting only the significant details.” She concludes: “It is the opinion of this reviewer that the film would be a very useful adjunct to a lecture . . . for the introductory course and for undergraduate experimental psychology classes, particularly if the lecturer finds the S-R [stimulus-response] reinforcement approach palatable. But since it is a good demonstration of instrumental conditioning, it is likely that teachers with different theoretical inclinations can also find a place for it in their courses.”<sup>2</sup> Indeed, although the film was used to present findings to Miller’s colleagues, the vast majority of its screenings were in educational settings, where the film took on a pedagogical value. And as Kendler suggests, the film was broadly screened beyond psychology classes. Along with the other films made at the IHR, *Motivation and Reward in Learning* was distributed by the Psychological Cinema Register, a repository of psychological teaching films operating out of Pennsylvania State College. The registry sent the film, and many like it, to hundreds of schools and colleges throughout the United States, where it was shown in introductory psychology courses, teachers’ colleges, zoology programs, and high school biology classes (fig. 7). Like the onscreen rats in the film, behaviorist educational cinema was adaptable, broadly accommodating multiple educational purposes and demonstrating different principles depending on the setting of the screening.

In this chapter I will argue that *Motivation and Reward in Learning* illustrates an important overhaul of educational media in the wake of animal experiments into behavioral psychology during the mid-twentieth century. Drawing from historical research and close analysis of the formal components of the film, this



FIGURE 7. Image of behaviorist classroom media. *Journal of the Society of Motion Picture and Television Engineers* (May 1952).

section reveals the impact of the animal laboratory as a vital site where films were produced and where the effects of spectatorship were tested. Film was an essential technology for the applied educational branch of behaviorism, a pursuit that was increasingly framed by findings from animal laboratory research. From their formal aesthetics to the circumstances in which they were shown in the classroom, behaviorist films and the theories of spectatorship advanced by their scientific creators transformed the role of moving images in education. Attempting to disconnect film from the ideals of educational reformers who guided the medium's earlier use in the classroom, the robust production, distribution, and screening of behaviorist educational films in the 1940s and 1950s reframed educational film as an essential part of the media ecology within a learning environment that controlled its inhabitants rather than providing them with new experiences of the world outside the classroom.<sup>3</sup>

Within behaviorist theories of media, being shown cinematic images of animal research was increasingly considered a type of stimulation akin to the shocks motivating the rats in Miller's film. Behaviorists produced a plethora of technical research, practical manuals, and theoretical constructs for mapping education onto the behavior of animals in the lab and deploying the psychology of stimulus-response through educational cinema. The mechanics of the projector and the screen, the commentary of the teacher, the use of supplemental texts alongside the film, and the structuring of cinematic scenes and sequences were all open for dramatic alterations and fine-tuning, working to produce film spectatorship as

a modifiable behavior rather than an act of either passive reception or tantalizing exposure. The arrangement of the laboratory experiment and the projection of educational media were made to mirror one another, allowing behaviorists to make unprecedented claims about their ability to control viewing experiences and produce learning in the minds of movie audiences. I conclude that the onscreen animals in films like *Motivation and Reward in Learning* reflected the intended experience of their viewers, who had their motivations and actions managed by their manufactured settings of the laboratory and the screen.

#### EDUCATIONAL FILM: FROM EXPERIENCE TO STIMULI

Current scholarship has uncovered the important institutional and technological developments that constructed a thriving production and distribution network for educational media in the first half of the twentieth century.<sup>4</sup> Additionally, recent works such as James Cahill's "Forgetting Lessons: Jean Painlevé's Cinematic Gay Science" (2012) and Jennifer Peterson's "Glimpses of Animal Life: Nature Films and the Emergence of Classroom Cinema" (2012) have analyzed the reoccurring animal figures that populate many education films in the life sciences.<sup>5</sup> Nonetheless, the role of behaviorist filmmakers, particularly those conducting animal experiments, has been largely ignored. Focusing on this particular brand of forgotten filmmaking practice reveals a wide array of new historical figures, theories, technologies, and representational strategies for deploying media in classroom settings.

From its inception, film was connected to programs of social reform, whose members claimed to use the medium to broadly shape the behavior of cinema audiences. The accessible and immersive elements of moviegoing offered the reformers of this time (including industrial employers, like the Ford Motor Company, and state and federal branches of government, like New York City's Health Department) the capacity to address diverse and unruly audiences through the creation of shared experiences.<sup>6</sup> As we saw in the previous chapter, Progressive Era reformers of the early twentieth century turned to film with the goal of instilling a sense of national identity and an awareness of American cultural norms in newly arrived immigrants, minority groups, workers, and the poor.<sup>7</sup> As Moya Lockett writes, progressivism was defined by "its deep concern with collective forms of self, its uplift, its reconsideration of public and private spheres, its heightened self-awareness, and its investment in stabilizing American national identity."<sup>8</sup> Oliver Gaycken and Jennifer Peterson demonstrate that education was a crucial component within this progress narrative.<sup>9</sup> Prominent figures such as Thomas Edison predicted that film would effectively overhaul teaching, bringing visual learning and experiences of the wider world into the classroom. Using the language of progressive reform, Edison framed educational film as a means of bettering oneself through accessible experiences outside the stifling confines of chalkboard lessons and assignments. The ideals of self-knowledge in the wake of new experiences, and

transforming oneself into a better citizen, worker, or student through the radically accessible medium of film, encouraged a mode of spectatorship that addressed viewers as ethical, political, and experiential subjects.<sup>10</sup>

In the latter half of the 1930s, a second wave of behavioral psychology renewed many of the buried ambitions of the Progressive Era within a new scientific context, including its deployment of film. Behaviorism originally grew out of Progressive Era social sciences, and both consistently demonstrated a shared “commitment to the solution of social problems via edicts from above rather than communal agreements from below.”<sup>11</sup> Behaviorism also largely took up progressivism’s mantle of reform and social change after the reactionary responses backlash of the 1920s.<sup>12</sup> But in this reaffirmation of the Progressive Era’s goals, behaviorists significantly changed the language and approach used to effect reform. Understanding the actions of living beings was no longer predicated on insight into unconscious desires but rather was perceived as the product of a predictive analysis of cause and effect. Throughout the mid-1930s, 1940s, and 1950s, behaviorist psychology de-emphasized internal experiences in favor of observable actions, a shift that effectively eclipsed other approaches to analyzing the workings and functions of the mind. This second wave of behaviorism ultimately revolutionized psychology, eventually leading to major developments in neuropsychology, human engineering, urban planning, and artificial intelligence, among other fields. John Mills, historian of psychology, goes so far as to claim that behaviorism’s approach to experimental research and its approach to American psychology generally have become indistinguishable thanks to developments in the 1950s.<sup>13</sup>

In addition to psychology’s approach to research, behaviorism also transformed how psychology was applied in the fields of industry, politics, and education. Behaviorist psychology was premised on an extreme form of instrumentality, and practitioners were interested in the utility of psychological study over and above other goals. As Mills outlines, this utilitarianism was made manifest both in the stripping out of moral and theoretical commitments from psychology and in the use of animal experiments to reemphasize control over behavior rather than plumbing the depths of affect or mind.<sup>14</sup> Laboratory rats, like those in *Motivation and Reward in Learning*, were not framed as moral or political agents but rather as variably responding mechanisms whose reactions could be predicted and regulated. The coupling of animal experiments with behaviorists’ focus on utility limited the value of a given study to its effectiveness, leading to a dramatic transformation of the language of applied psychology from one rooted in the ideals of reform to one that was increasingly technocratic and mechanistic. Rather than a vocabulary of uplift, integration, and citizenship, which defined earlier social science and educational media, the interventions of behaviorist psychology were strictly reserved for cause and effect—limited to questions of efficiency rather than ethics.

These changes were reflected in the films that behaviorists produced. The central debates between prominent figures in the first quarter of the twentieth century

prior to the ascension of behaviorism, such as those between Thomas Edison and John Dewey, focused on educational media's moral promises, dangers, and shortcomings. During the Progressive Era, the "physical and moral conditions" of film and its possible deleterious effects on children were hotly argued, promoting many early studies, polemics, and public handwringing over the effects of spectatorship on young minds.<sup>15</sup> We can see these dynamics in discussions of cinematic realism at the time. The immersive quality of film's photographic image was a central appeal for its educational use in earlier discussions and was linked directly to film's edifying potential. As Jennifer Peterson has shown, the feeling of "actually being there" was a major attraction for early educational travelogues.<sup>16</sup> Jennifer Horne writes that Thomas Edison's educational travelogue series *Conquest Program* (1917) included footage "based on its ability not to provide information, but to deliver an experience."<sup>17</sup> Particularly in nature films from the 1920s, realism in the production of engrossing experiences was seen as a main asset for engaging students and educating viewers, presenting them with exotic locales from the safety of the movie theater or the classroom. But the immersive quality of the photographic image also had the capacity to mislead particularly in contexts where the film was labeled "educational."<sup>18</sup> Especially in these early days of instructional nonfiction cinema, the presentation of realistic or objective information was often opposed to sensationalism, which was variously thought to detract from the educational quality of a film or to make the act of learning more engaging.<sup>19</sup> Some worried that film's realism could lead to passivity, its prerecorded images undercutting the development of agency in young minds. The interventions of the filmmaker-as-author and the mediation of the cinematic apparatus itself were contested subjects in relation to the original profilmic setting. As one commentator, Walter Halsey, wrote in a 1925 review for the *Journal of Education*, film may exhibit "a scientific demonstration of some truth," but "there is no opportunity to vary the experiment and answer the questions of curiosity and hence curiosity is not stimulated."<sup>20</sup> Halsey claimed that film may train "the senses and memory" but not judgment and therefore should be constrained in its use in the classroom. Each of these debates centered on the effects of the educational cinema on the morality and internal experience of student viewers.

Later behaviorists like Miller would change the stakes by interjecting new dynamics from the lab into the classroom and movie theater, transforming the discourse about instructional media away from the ethical stakes of representation and communication toward the efficiency of stimulus and response.<sup>21</sup> This can be demonstrated again through the example of realism in film. Behavioral filmmakers discussed realism as a quality of the cinematic image that could be heightened or lessened depending on the effect one wanted to produce and was disconnected from questions of morality and internal development. For them, realism was not considered an end in itself nor even directly wrapped up in questions of objectivity but rather was a property of the image that could be designed to have specific

effects on the behavior of the audience. In a 1953 report for *Audio Visual Communication Review*, the behaviorist Clarence Ray Carpenter argued that the word *realism* should be changed to *iconicity* and considered as a variable that could alter a film's status as a stimulus.<sup>22</sup> In his own writing on the topic, Miller further divorced a film's status as "realistic" from the events filmed, describing the issue of realism as a problem of "stimulus generalization" that referred to the processes through which viewers connected the images onscreen to their own behavior after watching the film.<sup>23</sup> He argued that realism could encourage easier generalization, which would enhance learning, but it could also confuse students by concealing the relevant information under a flood of unnecessary details. Miller concluded that realism should therefore be meted out according to the concept being taught, which may require varying degrees of detail or abstraction in each instance. For example, he argued, when one is learning to operate complex machinery, it may be necessary to represent the machine in granular photographic detail, but when one is learning a general principle to be applied in multiple different instances, an abstract diagram or line-drawn animation may be more appropriate. The point was to exactly produce a specific change in behavior through the expert wielding of auditory and visual stimuli contained in the film rather than addressing viewers as moral subjects, providing a faithful or objective rendering of the material world or transporting them to a new locale.

#### REGULATING THE CLASSROOM: BEHAVIORAL ANALYSES OF STUDENT SPECTATORSHIP

In the process of creating *Motivation and Reward in Learning*, Miller and Gardner Hart designed their film as one would an experimental tool—writing a list of objectives, constructing the set and testing apparatus to achieve these objectives, consulting with an animal handler from Miller's lab, and having fellow psychologists peer-review different cuts of the film.<sup>24</sup> Each stage produced new versions made to more precisely achieve Miller's educational goals. The final step in this process was a screening for psychology students at Yale University, who were then tested on the film's content. Yet, despite all of his detailed planning, on the day of the screening Miller was surprised by the students' response. For reasons unforeseeable to him, moments in the film provoked peals of laughter from the classroom.<sup>25</sup> This laughter was so loud that it drowned out the film's voice-over, which was being read over the classroom's public address system. Later, when the students were tested on the facts presented in the film, they were unable to remember what the lesson of those particular sequences had been. The students' spontaneous laughter disrupted the fine-tuned operations of Miller's film, derailing its intended control over viewers' actions. Just like the rats who attempted to escape Mowrer's filmed experiments (see chapter 5), these students resolutely refused to behave as the psychologists believed they would.

Written up in an article for the educational magazine *See and Hear*, this event is glossed as simply part of the postproduction of the film to maximize educational impact. Indeed, intent on avoiding this outcome in the future, Miller rearranged the narration so that the crucial information was presented before the images of the rats' unexpectedly amusing behavior. After screening the new cut, it was observed that students' aberrant responses had diminished. This account of the film's production is indicative of the broader shift in thinking about the use of cinema within educational media circles, where movies were increasingly pictured as mechanisms engineered to elicit specific responses from their audiences rather than created to present them with a window into new experiences. But, read against the grain, it also suggests the limitations of Miller's approach and the ways in which his models of educational media were often confounded by the actual behavior of spectators during screenings.

The *See and Hear* article ends on a hopeful note. Looking forward to new production practices guided by university teachers like Miller, it concludes: "By carefully planned collaboration with colleagues who are skilled in motion picture production and by pre-testing work prints in their classes, [behavioral filmmakers] can contribute to the development of the motion picture as an educational medium."<sup>26</sup> This sense of progress was symptomatic of a general optimism about the potential of applying new technologies and behavioral approaches to education during the 1940s and 1950s.<sup>27</sup> Throughout his career, Miller was an important figure within this movement. His "Graphic Communication and the Crises in Education," published in 1957 as a special issue of the journal *Audio Visual Communications Review*, returned to the concepts of *Motivation and Reward in Learning* from a decade earlier but considered them within the specific context of classroom media. Here, he produced a comprehensive literature review of new developments in the study of film's effect on student learning. He argued that the basic scientific principles of effective educational media were only just being discovered, distancing the new body of behavioral writing on educational media from the decades of debate on the subject that had preceded it.<sup>28</sup> Miller called for radically reallocating resources and research toward empirically and experimentally produced theories of graphic communication. As one reviewer wrote: "This document presents enough questions about the validity of films, as they are currently being made, to rock us all back on our heels and make us wonder whether we really know what we are doing."<sup>29</sup>

Miller's optimism and the weight that was granted to his theories, as well as the theories of behaviorism generally, were rooted in the dramatic changes in animal behavior that had been effected in the lab. As John Mills notes: "behaviorism's appeal to the profession of psychology as a whole was, purportedly, its ability to generate cast-iron laws of behavior in the animal laboratory."<sup>30</sup> Reading through the trade journals for educational film and reports made by psychologists at this time, one sees repeated allusions to the revolutionary potential of pairing

behaviorist theories from the lab with educational cinema. An ongoing refrain was that the mechanical advances in moving image technology had outpaced understanding of the “human factors” affecting reception, leading to a consistent misapplication of cinema’s evermore powerful tools of communication.<sup>31</sup> Understanding and systematizing the effects of a film’s form on viewers promised to “combat non-educational traditions,” as Miller put it, and transform educational filmmaking into a groundbreaking and exacting science like that performed in the lab.<sup>32</sup>

Toward these ends, many new experiments were conducted into audience reception, mirroring those produced by behavioral psychology with animals. These experiments extended and transformed earlier studies of film from the 1920s and early 1930s. Inspired by the ethical and reformist framework of the Progressive Era, empirical experiments had been conducted into audience reception in the interwar years. Early social science approaches to educational cinema were embodied most prominently in the Payne Fund Studies, which were conducted from 1929 to 1930. This series of experiments sought to produce a scientific answer to the moral questions surrounding film’s effects on children by measuring viewer responses such as body temperature, breathing, and heart rate.<sup>33</sup> Such efforts to objectively quantify the effects of spectatorship would be greatly enhanced by the behaviorists in the lead up to and the aftermath of the Second World War, leaving behind the Progressive Era moral framework that had initially inspired them. Indeed, the Payne Studies connect directly to the later work of Miller and his peers through the figure of Mark A. May, a central researcher in the Payne Studies and later the director of the Institute of Human Relations, where Miller worked.<sup>34</sup> The concepts proposed by Miller and John Dollard in *Social Learning and Imitation* (1941) were used by May in 1946 to argue that the theories of learning developed by behavioral psychology had yet to be integrated with the production of educational films.<sup>35</sup> In his published work, May proposed using this schema to deconstruct and study classroom settings when films were screened for students (fig. 8).

May not only wrote about the theory of educational media; he also oversaw and conducted his own experiments. From 1946 to 1954 he served as general chairman of the Yale Motion Picture Research Project, which was housed at the Institute of Human Relations.<sup>36</sup> Sponsored by the Motion Picture Association of America and the Teaching Film Custodians, the Motion Picture Research Project was dedicated to developing principles for creating effective educational films through experimental research.<sup>37</sup> Just as he proposed in his writing, much of the research May produced here adopted the language pioneered by Miller’s rat experiments. One of the Motion Picture Research Project’s first undertakings, conducted in 1947, studied the effects of motivation on learning while watching educational films. Using the conceptual findings of Miller’s experiments, the same ones that would be featured in *Motivation and Reward in Learning* one year later, this study measured student retention of information from four different cuts of an instructional film on the workings of the heart titled *The Heart and Circulation of the Blood*.<sup>38</sup>

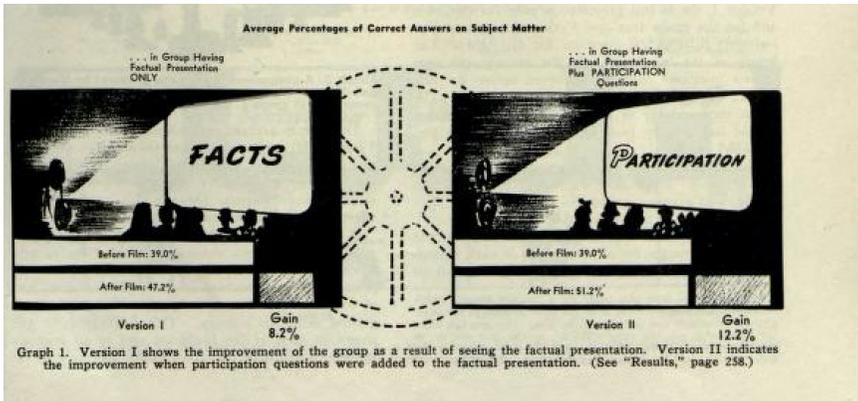


FIGURE 8. Illustration from Mark A. May's "Do 'Motivation' and 'Participation' Questions Increase Learning?" *Educational Screen* (May 1948).

One version included motivating prompts, open-ended questions meant to elicit interest before being answered by the film. Another version included participation prompts, which tested students on the material after a scene had finished. A third version included neither prompt, and a fourth included both. It was found that these motivating and participating questions significantly improved student learning. Gardner L. Hart, who prepared the films used in the study, also coproduced *Motivation and Reward in Learning* the following year, which unsurprisingly adopted this format, consistently prompting the audience to speculate about the rats' behavior before providing explanations for that behavior. At the end of the experiment, May used Miller's language of "motivation and reward" to analyze his data, concluding that a viewer who was stimulated to respond to the film would retain more from the experience.

In studies like May's, the film itself was envisioned as producing an analogous response to that created by an experimental apparatus, similar to the wheels, levers, and electrical grid in Miller's film. All could be designed to control the behavior of living beings in predictable ways if studied and isolated—whether rats in a lab or human students watching a film. In Miller's own writing about educational media for *Audio Visual Communications Review*, he articulated a vision of the classroom screening space that was increasingly similar to the site of an experiment. He often described classroom instructors and laboratory scientists interchangeably. In both cases, their primary goal, he said, was not to impart information but to stimulate and reinforce behaviors. In relation to instructional films, Miller argued that their job was specifically to encourage accurate mimicking by the students of the skills seen onscreen.<sup>39</sup> This could be achieved by rewarding—either through grades or praise—students who accurately recalled and reenacted the skills and lessons of the film. In so doing, teachers would facilitate the process of generalizing out

into daily life the behavior experienced in the screening. Toward these ends, the films themselves were a type of laboratory tool that, when wielded properly, could ostensibly transform the behavior of students.<sup>40</sup> Just as teachers became experimenters, educational media became part of a laboratory apparatus.

Reframing film as a controllable stimulus required changes in the layout of the classroom so that it could become more analogous to laboratory settings in which such stimuli were regularly studied. Miller claimed that daylight screens, looping film clips, and remotely operated and magazine-loaded projectors could all enmesh film more smoothly into the surroundings and daily procedures of the class while allowing for more variability in film's use.<sup>41</sup> Additionally, Miller advocated for the building of "prototype classrooms," which would include an overhead projector, push-button lights, and a control panel for pausing and running the film.<sup>42</sup> To simulate the institutional space of scientific research, the arrangement of the classroom was continuously transformed for greater, more precise, control. Even with these changes, the tightly maintained and monitored environment of the lab was not inherently similar to rooms full of students. Students were often unreliable subjects. In the normal routine of the class, they could not be comprehensively monitored and examined in the way that behaviorism's animal research subjects could. To complete the comparison, student responses needed to be closely observed and documented in order to track the effects of each screening—a difficult task with a room full of unruly and sometimes resistant children. A battery of experimental devices was introduced to test and monitor student behaviors during screenings. Through these devices students, like laboratory animals, could become compliant subjects of study, revealing the effects of particular elements of a given educational film. Everything from opinions to body temperatures were recorded before, during, and after screenings.<sup>43</sup> Students, like lab rats, were also approached and described by these studies as more or less interchangeable, represented as a singular aggregate of many individual responses. Through these technological incursions into the classroom a new set of behavioral theories arose to connect laboratory findings with pedagogy.

In addition to Miller, many of the central players in this growing field of mid-twentieth-century educational research were behavioral psychologists who began by working with animals. An extreme example of this can be seen in the primatologist Clarence Ray Carpenter's research into educational filmmaking. Carpenter's best-known animal studies were conducted in the field, where he pioneered the use of media recording in an attempt to "supplant the colorful tales of dramatic incidences told by sportsmen, hunters and travelers and embellished to make good adventure stories."<sup>44</sup> Toward these ends, he used a vast assortment of audiovisual monitoring devices to empirically register the behavior of primates in the wild. Carpenter made some of the first films of primate social behavior in their natural habitats.<sup>45</sup> These films included, among others, *Behavioral Characteristics of the Rhesus Monkey* (1947), *Social Behavior of Rhesus Monkeys* (1947), *Mountain Gorilla* (1959), and *Howler Monkeys of Barro Colorado Island* (1960).

Concurrent with the production of his primate films, Carpenter was also deeply invested in the theories and best practices of educational filmmaking. In 1940, he began teaching at Pennsylvania State College, where he ensured that Penn State eventually became the depository for the Psychological Cinema Register.<sup>46</sup> (As mentioned earlier, the Psychological Cinema Register was a central distributor for educational films of laboratory research and rented out the work of Miller and his peers at the Institute of Human Relations.) Additionally, during World War II, Carpenter had advised in the production of training films for soldiers.<sup>47</sup> During the war, he served as the organizer of the German Youth Reeducational Program and as chairman of the planning committee of the International Motion Picture Service, which was run by the Department of State.<sup>48</sup> In 1947, Carpenter became the director of the Instructional Film Research Program, which was funded by the Navy's Special Devices Center and that Army's Signal Corps to scientifically solve "the problems of rapidly training and instructing large numbers of people" through film.<sup>49</sup> Carpenter vividly described the program's agenda in retrospect: "We were hopeful that the scientific skeleton of the body of film art could be laid bare and defined."<sup>50</sup> Here he would develop increasingly complex methods for testing the effects of film on human behavior.

In 1950, Carpenter oversaw the development of two inventions for the Instructional Film Research Program—the "Film Analyzer" and the "Classroom Communicator"—that vividly demonstrate behaviorists' ongoing conceptualization of classroom spectatorship as a type of laboratory experiment.<sup>51</sup> Sponsored by the Office of Naval Research, the purpose of these devices was to "record and time continuously a range of reactions and responses of individuals in groups . . . to various kinds of instructional and informational programs."<sup>52</sup> Both of these machines could work together, each plugging into a set of "stations" where individual student spectators would be placed. Essentially desk chairs, these stations contained enclosed boxes into which viewers inserted their right hand (fig. 9). Within the box were five buttons, one for each finger, which would send an electronic signal to either the Classroom Communicator or the Film Analyzer, or both, depending on what was currently being tested. During the film, student viewers would be prompted to respond to multiple choice and true or false questions about the film's content by pressing these buttons. The Film Analyzer recorded the times and responses of each station, which could be directly tagged to the moment in the film when they were made; these responses were then produced as a polygraph printout of lines and dashes at the front of the room. The Classroom Communicator presented a control center for the instructor/experimenter, which included a grid of lights, each representing a single station, which would flash on and off when questions were answered correctly. Its purpose was to give instructors and experimenters a real-time overview of the progress in the class as the film played. These inventions were imagined as tools for both research and teaching, gauging students for the purposes of evaluating the film's effectiveness and the progress of the students. Through their invention, Carpenter and his team of researchers

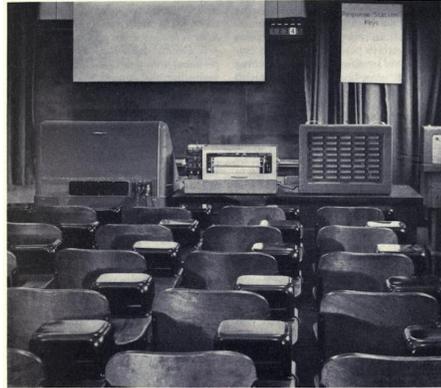


FIGURE 9. Photograph from “A Scientific Approach to Informational-Instructional Film Production and Utilization.” *Journal of the Society of Motion Picture and Television Engineers* (May 1952).

conceived of spectatorship as a dynamic, changing behavior on the part of the student that needed to be tracked and revealed through the intervention of recording devices.

In his research into educational media, Carpenter was extending the practices of his primatology fieldwork to the classroom setting. There were direct parallels in the content and methods of both strains of study. As in behaviorist practice generally, Carpenter was intent on extending concepts from the laboratory out into the field and then back into the classroom. He is remembered primarily for his important early innovations in methodology, where he brought together precise notation and recording techniques from the lab to ecological fieldwork.<sup>53</sup> These methodologies were perhaps the clearest link between his primatology and his work in media theory. As a primatologist, he pioneered the use of technology as a means of systematic notation.<sup>54</sup> Pushing back against the common perception of field studies as passive observation, he increasingly deployed high-tech devices for monitoring and even influencing his field subjects (fig. 10).<sup>55</sup> In so doing, he made open, uncontrolled settings in the wild increasingly predictable, manageable, and accessible to the behavioral theories of the lab. Inventions like the Classroom Communicator and the Film Analyzer similarly transformed the “field” of the classroom, which became equally surveyed and controlled through technological means. Ultimately, both “wild” spaces required terraforming, which Carpenter achieved through complex monitoring apparatuses that bridged experimental research and naturalist observation. Carpenter’s career stands as a stark example of how the borders and influence of the laboratory were expanded to incorporate spaces that previously had epitomized unruliness and disorder into the logic of the lab.

In Carpenter’s work, film functioned as a conduit for comparing the reactions of laboratory animals and students. Under the proper settings created by innovations like the Classroom Analyzer, the images and sounds of film could replace the



FIGURE 10. Photograph from “Behavior and Social Relations of Free-Ranging Primates.” *Scientific Monthly* (April 1939).

shocks and mechanisms of the cage, extending analyses of the behavior of lab rats to human students in the classroom. This underlying comparison between laboratory experiments and educational media determined how many behaviorists made films, implicitly connecting lab animals and students even when the films themselves did not feature nonhuman specimens. As we have already seen with the *See and Hear* account of *Motivation and Reward in Learning*, these films were meticulously designed to create an onscreen environment like that of a laboratory apparatus, in which specific behaviors could be precisely pulled from audience members. *Motivation and Reward in Learning* is unique in Miller’s frank pairing of his laboratory animal studies and his educational media research. Indeed, there is a strange mirroring effect that takes place between the viewing and the content of *Motivation and Reward in Learning*, producing an unexpected example of *mise-en-abyme* in scientific filmmaking. The behavior modifications of the rats onscreen—their “learning”—reflects the intended behavioral modification of audiences in classrooms that will later view the same film.

Miller explicitly connected the rats’ behavior within his film to the act of viewing educational media, building out an entire theory of spectatorship in his *Audio Visual Communications Review* report, “Graphic Communication and the Crises in Education,” which was based on the key concepts developed in his rodent experiments.<sup>56</sup> He argued that “drive,” “cue,” “response,” and “reward”—the key concepts illustrated in *Motivation and Reward in Learning*—were essential for understanding learning in both rats and humans. His writing extends each concept from his animal experiments to explain the behavior of student viewers. For instance, in experiments documented by the film, “drive” was produced in the rats either through starvation or electric shocks. Similarly, Miller argued that filmmakers must learn to harness already-present drives in schoolchildren, such as the desire for prestige or to avoid punishment. By connecting these drives to specific scenes in the film, students would be motivated to behave as ideal spectators—silently and attentively watching the film. In his own articulation of cinematic identification, mirroring that of the Kuleshov effect, Miller drew from previous

studies into audience reaction to suggest that point-of-view shots could be used to tie viewers to the action onscreen, thereby channeling their preexisting desires through the film's onscreen surrogates.<sup>57</sup> Miller saw this effect as iterative of the change in rats that were motivated to adopt new behaviors in his experiments. He performs a similar analysis of "cue," "response," and "reward," broadly connecting the formal elements of the moving image back to the rodent experiments he had first filmed in *Motivation and Reward in Learning*. These concepts both make up the content represented in the film and simultaneously informed its production. *Motivation and Reward in Learning* thus depicts its own theory of cinema at the same moment it enacts this theory on the viewer.

Although Miller's film was released nearly a decade before he explicated his theories of education publicly, its relationship to pedagogy was not lost on educators at the time, who saw it as part of a growing body of useful knowledge being produced in behaviorist laboratories. As one 1953 review put it, modern teachers were "benefiting from the material on film which is being reported out from the experimental laboratories. The many implications for the classroom situation to be found in *Motivation and Reward in Learning* . . . [are] a case in point."<sup>58</sup> This reviewer also provides a list of other laboratory films, such as *Cats in the Puzzle Box* (1938), *Elevated Maze Learning in the White Rat* (1943), and *Color Categorizing Behavior of Rhesus Monkeys* (1947), as examples of similar films of behaviorist experiments with animals that shed light on the processes of human learning. Ultimately, for viewers at the time, animal figures in these films both represented direct knowledge emerging from the lab and stood in as metaphors for behavioral psychology's capacity to manage students in the classroom. They were thus strangely ambivalent images, existing as both concrete depictions of particular scientific experiments and as allegories for scientific power to potentially control all sorts of other behaviors. Similar to how Yerkes used to describe his work, the representation of animals in these films functioned as "an effective demonstration of the possibility of re-creating man himself."<sup>59</sup>

#### LIVING ABSTRACTIONS: ANIMAL REPRESENTATIONS IN BEHAVIORIST EDUCATIONAL FILMS

A close reading of the aesthetics of these films shows that this allegorical function dramatically transformed how animals were represented. In her analysis of the educational animal films of the 1920s, Jennifer Peterson argues that they were predominantly made in the mold of naturalism and embodied the ideals of learning through experience that circulated during the Progressive Era. Their structure harked back to older models of animal research, which she demonstrates were more amenable to popularization than methods of animal research emerging from specialized laboratory sciences during and after the First World War: "nature films did not so much teach current scientific ideas as present an older model of natural

history; rather than introducing lessons on modern zoology, anatomy, or genetics, most early nature films simply pictured and described the natural world.<sup>60</sup> Films such as *Struggle for Existence* (1925), *Wildlife on the Desert* (ca. 1920s), *The Cuttle Fish* (ca. 1920s), *Some Seashore Animals* (1930), and others presented animal subjects in their natural habitats and prompted adolescent audiences to inhabit the perspective of a taxonomist—learning to identify, describe, and catalogue the onscreen specimen. As Peterson outlines, spectators were often seduced into engaging with these films by surreptitious staging, the imposition of anthropomorphic narratives, and the crafting of artificial sets. She concludes that these films contain an ever-present tension between relying on stylized interventions to create entertainment, on the one hand, and using mechanical objectivity to present an academic or scientific vision of their animal subjects, on the other.

But *Motivation and Reward in Learning* emerged from a very different strain of educational filmmaking in the postwar years, guided by a separate set of tensions. As I noted earlier, realism and objectivity—as well as their inverse corollaries of sensationalism and entertainment—were not goals in and of themselves for Miller, which dramatically changed how he represented his animal subjects. Miller's film contains no traces of “natural” settings, artificially simulated or not, which define the earlier films studied by Peterson. Instead, *Motivation and Reward in Learning* takes place in a highly stylized space that resembles no actual location in the real world. Yes, we see the testing apparatus, which evokes the lab, but this apparatus is also surrounded by darkness, floating in a void without context. The figures' isolation within the frame is undoubtedly the product of Miller's approach to realism, in which he felt the details of the laboratory setting would only distract the audience. Rather than an immersive window onto a new experience, Miller's film is a collection of isolated views tied together by the film's voice-over and title cards. The end result is surreal, as if the rats exist within a psychological rather than material setting, inhabiting a purely ideational space of abstraction and measurement. The decidedly constructed nature of this space is neither concealed nor addressed by the film. Within the theoretical schema of behaviorist pedagogy, authorial intervention by a filmmaker, as well as the artificial manufacturing of scenes in a film, was not an act of misleading fabrication but simply the refining of a tool, a process that carried no moral weight and that did not need to be disavowed.

Other interventions into the representation of the rat were less ostentatious. The diversity of its responses, many of which did not directly relate to the principles of motivation and reward that Miller was hoping to teach, were silently removed from the film for the purposes of clarity. As the *See and Hear* article describes, many costly takes needed to be discarded before the rodent actors performed as the filmmakers hoped they would.<sup>61</sup> As we saw in the opening to this chapter, reviewers of the film considered the clarity of this manufactured performance as one of the primary strengths of the film, especially since demonstrations with live animals were often unpredictable and therefore could lead to

unnecessary confusion.<sup>62</sup> By shaping the rat's behavior through the editing of the film, Miller dramatically changed the representation of the rat as an animal. If the earlier natural history films analyzed by Peterson present their nonhuman subjects alternately as characters in anthropomorphic dramas and as strangely opaque "animals in themselves," Miller's film presents the rat as a kind of medium, part and parcel with the film itself.<sup>63</sup> The rules of learning as such, rather than the rat, are what is represented by this film. This structure ultimately allows the rat only a very proscribed interiority, one that is clearly labeled and defined by the film's author. Even the rat's initial erratic behavior before being conditioned to respond to the apparatus is enclosed by the film as simply an early stage in the developmental framework of motivation and reward. Miller's control over the representation of the rat, his readily apparent fabrication of the sets and editing of its performance, were not read as detracting from the film's scientific objectivity. Instead, interventions into the animal's behavior, either experimentally or through the editing of the film, were seen by Miller and his contemporaries as the fine-tuning of a mechanism and the shaping of a stimulus. The rat and the film both speak of a subject beyond themselves, of the behavioral principles that Miller crafted them to communicate. They are instruments of the classroom setting into which they are placed, cues within the visual realm of the students, and tools for the behavioral intervention of the instructors.

We have seen how certain theories, studies, and cinematic texts connected animal laboratories to American classrooms in the 1940s and 1950s. Within this context, images of rats like those in *Motivation and Reward in Learning* took on a different valence than they would have had before. For their creators, these images spoke to the power of properly mediated and controlled surroundings for dramatically altering behavior. Within the classroom, Miller and his peers envisioned film as a means of transforming the educational setting, a tool for bringing theories of teaching up to date with the newest findings of experimental psychology. Underlying this application of behavioral theory was, of course, the much-maligned comparison of students and rats (a comparison for which Noam Chomsky devastatingly skewered B. F. Skinner in 1959, which we will examine in chapter 7).<sup>64</sup> Both students and lab animals were increasingly monitored and regulated, subject to principles beyond their own control. But for Miller, these were images of profound hope, images of a future application of technological and psychological progress. Within his disciplinary context, these images of laboratory animals were transformed into universal images of spectatorship. They offered the promise of a tool that could effectively intervene and engineer the development of students. The dangers and the aspirations of behavioral control that emerged from the animal laboratory are recognized as part of scientific and psychological history, but, as I hope I have demonstrated, they are also part of film history. As we enter an era in which screens and behavioral analysis are more and more becoming a staple of the

classroom, a clear-eyed look at this pivotal period in experimental psychology and educational media becomes increasingly urgent. The behaviorist and the lab rat should be added to the pantheon of metaphors and theorems, treatises and allegories, through which film has been historically framed—vital figures for considering the effects of cinematic imagery on our minds, bodies, and actions.