The Science of Fun and the War on Poverty

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The Edison Responsive Environment
own discoveries” of the connection between sign and sound—regardless of the propositional content found on a page of asterisks or in the vocalization thereof. As historians of cultural techniques of alphabetization and numeracy have shown, since the late nineteenth century psychologists have experimented with the minimal conditions under which sense can arise from nonsense. Moore, too, was engaged in a debate over the question of whether reading and writing arise most readily through phonetic training or whether graphical systems are “sufficiently isomorphic” to the spoken word, as he emphasized, for writing itself to be a powerful preparation for reading. In these “talking typewriter” experiments, as contemporaries would have known them, the attendant by the child’s side—or the machine that would later replace the attendant—simply named a symbol. The passive responsivity of the attendant or machine, creating only a minimal structure for guiding the formless glee of unbridled inscriptions, “allows a young child’s creative imagination,” as Gilmore wrote, “to soar by quickly and painlessly helping him overcome the reading and writing hurdle.”

An effusive string of asterisks or dollar signs, or even a lull in the uninstructed typist’s activity, isolated for the attendant’s observation the disinhibition or continued frustration of an ambiguous, underlying well of feeling. The talking typewriter’s proponents called this feeling the “autotelic” sense. The typewriter, equipped with communications protocols, became an object through which an enigmatic affective entity called autos without determinate telos came into view for a specific set of historical actors as a workable material. In his 1961 lecture “Education Automation,” the architect R. Buckminster Fuller—recalling a meeting with Moore at the World Affairs Conference in Colorado in 1961 and a report on the talking typewriter in Time—defined the autotelic as a “drive of the new life to demonstrate competence.” The autotelic sense was what military psychologists and liberal reformers of the 1950s and 1960s, as well as the computer scientists and programmers of the late 1960s and early 1970s, would call “intrinsic motivation,” or simply “fun.”

By 1965, banks of magnetic drums, decks of slide transparencies, and 6-bit programmable magnetic cards had displaced the attendant to the outside of an isolation booth. From outside, she watched the child through a two-way mirrored porthole, monitored a keystroke count on a dial, and listened to protests and queries over an audio channel that she used to communicate with the child only if the befuddled typist expressed the wish to end the thirty-minute session. Moore called this automated update to the talking typewriter “the Edison Responsive Environment” (ERE). Inside the soundproof
booth, the child was free from the “kibitzing” of adults, reasoned Moore. The contexts that informed his work—through which he entered into a two-decade-long collaboration with African Americans in Hamden, the West Side neighborhood in Chicago, and the Hill District in Pittsburgh—spring from those two words: responsive and environment. The former term was shaped by Moore’s interactions with computer scientists and logicians at Yale University, Carnegie Mellon, and the University of Pittsburgh. Through these collaborations, Moore influenced the early artificial intelligence (AI) research of Herbert Simon and Allen Newell—a key moment in the founding of what computer historians now call “symbolic AI.” The term environment was the result of his collaboration with psychologists at the Office of Naval Research (ONR) Group Psychology Branch, the RAND Corporation, and the Carnegie Corporation during the 1950s and early 1960s. In these military contexts, Moore was instrumental in the design of the radar operator training program used in the North American radar defense network known as the Semi-Automatic Ground Environment (SAGE).

What Moore called the “hypothetical child” of his 1960 language-learning environment would by 1972 become an abstract model for the ideal personal computer user. Moore first built his abstract model of the hypothetical child in 1950s military contexts. Rather than writing code to actuate electronic displays of light and glass, he used patch cords to rewire electromechanical teaching equipment into experimental logic puzzles embedded in study carrel isolation chambers. Similar stories of how military psychologists and engineers translated such theories of and designs for communications systems into military computer technology (usable by the technically uninitiated) are well known. But why was it that the school reformers of Lyndon B. Johnson’s War on Poverty were so attracted to the ERE? Why would Moore’s experiments be considered by these administrators as a viable component in the reformer’s toolkit?

Though I briefly track the ERE through these well-known contexts—the computer science of early AI and the military psychology of structured learning environments—my main concern is Moore’s work on Project Breakthrough as part of the War on Poverty. In that project, the Cook County Department of Public Aid and the Office of Economic Opportunity (OEO) collaborated with local social workers and mothers whose children from the Cabrini-Green housing project were bused in for sessions with ERE equipment at the Westinghouse Vocational High School. Their visits occurred in the summer months before they began learning to read in school. The OEO and Cook County, as well as the Columbia Broadcasting Corporation, produced films documenting the project.
Hall, as students progressed through the stages of the ERE program—that is, as they learned to write out words, sentences, and stories alone in a booth with the talking typewriter—they would eventually edit together the best of their imaginative work and publish it in the pages of an elementary school newspaper. Titled the Lab Record, a facsimile of the fourth issue entered into the records of the Great Society Congress as documentation of the results that could be expected from the “new society of automation and cybernetics” in the War on Poverty to come.25

When the Johnson administration set out its plans for the War on Poverty at the Great Society Congress from January 1965 to December 1966—the Congressional session that passed the Voting Rights Act, the Immigration and Nationality Act, the Elementary and Secondary Education Act, and the Social Security Act—the role of educational technologies had already been establisg by Title VII of the Defense Education Act of 1958. Title VII provided funds for research into the educational use of mechanical slide viewers, typewriters, calculators, educational television, and filmic simulations of classroom behavior for teacher training.26 As Jennifer Light reminds us, even though the Great Society and the War on Poverty are remembered as comprehensive social-reform programs addressing the plight of African Americans in America’s large cities, reformers also approached black neighborhoods as “urban problems [that] presented threats to domestic order,” threats that required tech-
nological solutions. Given the role played in these programs by former employees of the defense contractors RAND and the Carnegie Corporation and by the communications technologies promoted by these “defense intellectuals,” the War on Poverty, according to Light, should also be remembered as a “controlled development [of communications infrastructure designed] to bolster the nation’s internal security from Communism and from further violence” in its inner cities. As scholars of video games and computer history have shown, defense intellectuals also developed key communications techniques and production capacities—such as the network technology of time-sharing systems, plasma screens, and clean rooms for electronics manufacture—using funds for educational technologies to finance their work.

The mathematician Norbert Wiener—the most famous champion of the term cybernetics—used the word learning to elucidate, in its most capacious form, the idea that a dynamic process underlaid the boundary between organic life-forms and synthetic control mechanisms. The slow clustering of gasses in a nebula around an invisible attractor; the buildup of impulses racing through the nervous systems of a mongoose and cobra as they danced in mortal combat; the registering of inputs in computer memory that then changed the structure of the program effecting computational outputs—all were instances of learning for Wiener. “[A]s long as the automaton is running, its very rules of operation are susceptible to some change on the basis of the data which have passed through its receptors in the past, and this is not unlike the process of learning.” Learning named the play of order and chaos in the dissipation and attraction of cosmic bodies, the drama of thrust and parry as it influenced the growth of complex nervous systems, the circuit between signal and response. The loop so often described as an equilibrium-seeking feedback mechanism was always a model of a learning process punctuated by boundary conditions and decision points and ordered by sedimentations in memory. Or, to paraphrase Alexander R. Galloway, cyberneticians displaced linear models of cause and effect with statistical models of “causality as pedagogy.” The controlled environment of the ERE was a pedagogical limit condition on the formation of temporary zones of goal-oriented coherence that grew over the course of the learning sequence. In the War on Poverty, the infrastructural development of computing clustered around the formless plasticity of the hypothetical child. The viability of educational computing as a War on Poverty reform effort led to a search for techniques of programming that could turn formless nervous glee into purposeful, reasoned expressions maturing in the loop between keystroke and audition.
Computing Nonsense
Any comparison of the ERE to what computer historians call the “single-user workstation” of the 1950s and 1960s, or with the mainframe computer teletype terminals also used in educational experiments during that era, would soon find ERE lagging far behind the state of the art even for 1960. The ERE would have appeared positively anachronistic if placed side by side with the 1970s updates to the Programmed Logic for Arithmetic Teaching Operations (PLATO) time-sharing system. PLATO IV consoles had plasma displays, instant messaging, and networked games in 1972 when Moore was figuring out the consequences of AT&T’s Picturephone technology for his work with children in Pittsburgh’s Hill District. Moore was interested in making computing a “Warm Medium,” as he put it (modifying Marshall McLuhan’s terminology). The idea was that the Picturephone could replace the booth attendant, allowing Moore and his students to expand their initiative in the Hill District while maintaining what they called the “quality control” that his antikibitzing theory of noninstruction demanded. Booth attendant trainees from the Hill District—“competent, highly motivated black professionals drawn from the neighborhood”—could learn the protocols of ERE surrogacy by watching Moore interact with ERE learners through the Picturephone porthole. His televisually “miniaturized” size would make his image approachable for black youth, Moore thought. Blurry video feeds and containerized electromechanical teaching gear
filled the gap between computing as a science of control and the coming era of personalized computational devices.

Though screens and network technologies would become essential to the success of personal computers in the late 1970s and early 1980s, it was research on logical form undertaken through the ONR’s Group Psychology Branch that provided the programmers of this later generation with the logical tools needed to code with an abstract model of the ideal user in mind. Claus Pias argues that the hypothetical user might be considered as having always been what he calls an “illiterate user” modeled on African American soldiers submitted to intelligence testing by psychologists Edward L. Thorndike and Robert M. Yerkes during the First World War. Thierry Bardini and Fred Turner argue (in their histories of the prototype personal computers of the 1960s) that academic computer scientists and countercultural technological utopians articulated an ideology of liberation through personal computing using the ideas of networked entrepreneurialism and accessible user-friendly software as their core principles. The management agenda of defense intellectuals became superficially differentiated from a rhetoric of connectedness and mass-market computer liberation. Yet, if we were to conclude that the unintelligence of the so-called illiterate user primarily licensed the learning-talk hucksterism of an edutainment market while legitimizing the “carefree autodidacts” and “power users” of 1970s programming for kids (as does Pias), or if we were to recirculate the self-promotion practices of cultural elites in “cybernetic art worlds” by reinscribing the boundaries of their countercultural cliques into the annals of computer history (as does Turner), then the question of what aspects of the hypothetical or promissory user have been repressed, or forced into structural unimaginability, remains unaskable.

Perhaps the media history of computing could, in revisiting these important works, find ways of splitting itself into always “partly understood” narratives that approach the “undercomputational nonsense” on which elementary techniques of domestication imposed their boundary-forming inscriptions—to register the hesitation of Donna J. Haraway alongside the guidance of Fred Moten. In isolating, disinvesting, and resourcing such nonsense, social scientists planned the redesign and reindividuation of computing into its personalized form. Maybe the profligate American use of fun forced that word into untranslatability precisely because the autos without determinate telos admitted the dispossessed and unvalued into the relays of defense intelligence at the same time that it mobilized the image-production pipeline of self-moving learners animated for the world stage—an unutterable indemnification. Moore always found awkward fleshy moments leaking through
the porthole of the ERE as each hypothetical child socialized with a fiddly keyboard. At times, he seems to have been listening to that silly clicking and hearing therein what Moten calls the "impossibility of flesh’s divestment." The design of the ERE and its televisual image—appearing on ABC during the Hamden Hall years and then on CBS during Project Breakthrough—fulfilled a collective wish for an un tarnished and competitive American child: the image of superior freedom. The process of remembering the pervasive technological manifestations of such a collectively repressed wish fulfillment might help us name, repeat, and work through the automatic avoidance moves left behind in the afterlife of experiments with the hypothetical user.

As Moore explained through his reading of sociologist Georg Simmel, isolating fun was one way of responding to the "alienation" of the general intellect in classed society by reactivating core linguistic and logical traditions within a programmed environment disarticulated from a hierarchal distribution of sheltered zones for knowledge transmission. Moore designed the ERE to redistribute shelter. Unlike the Chicago urban planners of the inter- and postwar years before him—concerned primarily with plans for rezoning and slum clearing inspired by ecological thinking—and the proponents of modular school construction in his day, Moore did not believe that building alone could reformat the city for the sake of social welfare. Buildings, for Moore, were containers that isolated and shaped learning for the sake of sheltering that process from problematic social forms. Seen from this historical perspective, the origins of the personal computer were not particularly computational. The first deployment of computerized electromechanical teaching equipment resolved an ambivalent and unactionable worry into a controlled resourcing scheme that first defined the kind of elusive aspirational and mental fabric from which to extract value while simultaneously addressing what Moore called "the challenge of the '60s."

On the one hand, that challenge took the form of a push to erase a disparity in the racial and geographic distribution of intelligence test scores. Test scores on intelligence quotient (IQ) exams and standardized aptitude tests seemed to have shown that the urban context affected racial groups differently. For example, at the 1964 Invitational Conference on Testing Problems (where Moore also presented his work on the ERE), Gordon Fischer of Hunter College reported that "Jewish" and "Chinese" populations scored better in reasoning and numerical metrics for both "Middle & Lower Class" groups than "Negro" and "Puerto Rican" children in the same economic categories. At the same conference, Richard Wolf presented "The Measurement of Environments," in which he defines the home environment...
as either lacking or providing motivation for learning and offering or denying opportunities for proper verbal performance as well as being populated by individuals with specific IQs. In this wider context of environmental measurement, the ERE was an environmental intervention strategy designed to erase a racialized psychometric divide.

On the other hand, these technological efforts in what War on Poverty reformers called the “educability” of intelligence were scientific delegitimations of “poverty culture”—a term that allowed the organizers of Project Breakthrough to account for these differences in quantifiable intelligence using the language of “deprivation” rather than that of innate hereditary potential for intelligence. The study pod was a “normative utopia”—Haraway’s name for postwar animal studies that work on the principle of controlled learning environments. It removed children from domestic contexts deleterious to the neurological development of basic cognitive capacities by providing surrogate motivating influence. The invention of the personal computer resolved this inarticulate worry—wavering between equalizing liberal erasures of difference and a technologically implemented backdrop of mandatory purposeful behavior—into a kit of parts for powering electromechanical teaching equipment housed by environmentally controlled architectures.

Gayatri Chakravorty Spivak pinpoints precisely the crux of this ambivalence permeating the talking typewriter in her reading of cybernetician Gregory Bateson’s concept of the double bind. She asks that we attend to “the difference between information control and learning to read.” If any attempt were to be made to disentangle “maximal capitalism and unmediated cyber literacy” from “[p]lay training, an aesthetic education,” then part of that challenge might be to rethink the gift of computation as something other than a trial run in engineering subaltern aspirations through a reinvented wish for what Spivak calls “good imperialism.” The domestication of the computer seems to have taken place first by redrawing the line between the scientifically delegitimized postnatal environment of the black home and the course of a neurologically normal child development time line organized by the sheltered environment of the study pod.

That time line was an originating institution of what Sylvia Wynter might call the propter nos—the for us or for our sake—of the coming laity of amateur personal computing. That laity was a group disarticulated from the priesthood of mathematical and engineering expertise but using the products emanating from academic enclaves of coding practice to create a mind-set, life path, and “flight of ideas” that could circumnavigate troublesome nonparticipants and classist barriers to entry to the
Anglo-Saxon elite. The ERE displaced the discomfort of living through racial and class difference onto a project for the future of computation. This does not mean, necessarily, that such amateur technologists or researchers were bad people. A straightforward callout or takedown limits study to critical self-sufficiency. But these engineers and their acolytes were caught up in what for them was often a joyous dream or deep wishful thoughts lavished on the promise of technological disavowals of troubling situations.

Preemptive treatment programs for imperiled youth resolved into catchphrases and teaching-gear laboratories the ill-defined problems of what the Project Breakthrough administrators called “poverty culture,” “maternal deprivation,” and “brain damage, emotional disturbance, social-cultural deprivation, and the like.” By what channels of influence was the promise of personal computing, and the weirdness of the ERE, captured by a plan for the postwar rebuilding of the democratic subject of responsible social intercourse? How did that subject become a politically neutralized model student or ideal user qua humanitarian information processor? The answer to these questions requires a brief digression into Moore’s early career at the ONR Group Psychology Branch. These historical details illuminate why the ERE became the promissory emblem of cybernetics in education and why films, writings, and photographs of Moore’s young students from Hamden, the Hill District, and the West Side circulated so publicly.

**Isolating Fun**

Before his work with children, Moore served as a sergeant in the headquarters of the U.S. Army’s 459th Heavy Bombardment Group in Italy from 1942 to 1945. He then pursued graduate work at the University of Florence and Columbia University before receiving a Ph.D. in sociology from Washington University in 1949. He began work with the Group Psychology Branch of the ONR in 1953 and directed that group from 1955 to 1960 while holding the position of assistant professor in Yale University’s Sociology Department. At Yale, he designed and constructed the Interaction Laboratory on the fourth floor of Linsly Hall. At the ONR, he built the Microlaboratory. Moore filled these laboratories with electromechanical teaching equipment and classroom furniture: study carrels, room partitions, patch cord telephone boards, ammeters, magnetic tape decks, microphones, and slide projectors. He used this teaching equipment to design communications networks and electromechanical logic puzzles for the experimental study of what he called “human ‘higher-order’ problem solving.”

To perform their problem-solving tasks, eighteen-year-old U.S. Navy recruits learned modern logic by collaboratively
manipulating the formal logical symbols of propositional calculus. The recruits collectively selected rules from a list of operations, pushed a buzzer to register the timing of their decisions, and announced their move to an officer standing behind a mobile room partition. The problems they worked on were not unlike the word problems on the modern SAT. But Moore had designed this “contrived experimental ‘cosmos’” using only the abstract symbolic terms of modern logical notation—p’s and q’s—thereby rendering the experiment a study of the group dynamics of logical language learning.\(^6\) Nobel Laureate and economist Herbert Simon and computer scientist Allen Newell acknowledge that Moore’s laboratory designs, logic-puzzle experiments, and logical models of learning influenced their early work on the Logic Theorist and General Problem Solver symbolic AI programs.\(^7\) Military psychologists working for the RAND Corporation translated Moore’s designs and puzzles into training equipment used in the Systems Research Laboratory (SRL), a prototype control room for the computerized SAGE radar defense net.\(^8\) The SRL contained an electro-mechanical, pinwheel-paper mock-up of the SAGE system’s light-gun-controlled radar tube stations designed using Moore’s autotelic design principles.\(^9\) Addressing purposeful “fun,” SRL psychologist John L. Kennedy explained, “The autotelic principle may need modification when applied to more mature organisms, but it does suggest the necessity for attending to attitudes and motivation in designing learning situations.”\(^10\)

At the SRL, fun translated into a means of keeping radar operators on task while they attended to incoming radar signals displayed on the SAGE system’s cathode-ray tube consoles. Fun was a material useful not only in measuring the breaking point of tube attendants’ attention spans. The tube attendant was part of a relay by which officers, overlooking banks of radar consoles from a mezzanine, mediated between human input to the radar tubes and phone lines connecting the radar stations to the Air Force.\(^11\) Fun was also a connective glue consolidating attention on screens and organizing the management of that collectively constituted object of networked attention. Both before and during Moore’s tenure as director of the Group Psychology Branch his colleagues used study carrels patched together by switch boxes to experiment with the effect of network topology on the relational dynamics of such group problem-solving
scenarios. These studies traveled to the Macy Conferences, a series of meetings that organized the reception of cybernetic mathematics for American social sciences in the 1940s and 1950s. The timing and accuracy of task-oriented group work as well as the morale of the team were found to be optimized only when the group could identify relatively centralized (and therefore authoritative) nodes of communicative activity efficacious in coordinating the groups’ problem-solving. Unproductive anarchism resulted from too many interconnections, while selective alienation—that is, bullying—resulted from completely centralized control.

While at Yale, Moore also met the logician Alan Ross Anderson, working with him to devise logical models of the learning process. Using the Yale Human Relations Area Files—a vast collection of cross-referenced index cards gathering and organizing ethnographic data on world cultures—they found that their logical theory of learning accounted for regularities in the archives of the material culture of play and games. The files were teeming with what Simmel called “play-forms.” Moore and Anderson followed Simmel’s line of thinking further, interpreting the games and play filings of the Area Files as a repository of Simmel’s “objectifications of mind” resulting from an “autonomization process” by which schematic models of mental form had been materialized by “pre-scientific” peoples into ludic “cultural objects.” All peoples had used games,
puzzles, and chance operation generators (such as dice) to model the natural and human worlds and to provide learners with autonomous zones in which to hone their mental and physical abilities.\(^{78}\) Each of the play-forms—the puzzle, the game of chance, and the game of strategy—were subdomains of “autotelic folk-models,” added Moore.\(^{79}\) As he would later paraphrase Simmel, “[o]ne might think of folk-models as constituting the theoretical arm of a society’s pre-scientific culture.”\(^{80}\) In the context of roughly contemporaneous advances in the mathematics of probability (chance), game theory (strategy), and the logic of problem-solving (puzzles), this archive of play-forms outlined horizons of programmability that would connect such formal models of the game player to the relays of the experimental study carrel, the SRL paper-screen trainer, and the ERE.

Moore transformed his experimental logic work into the ERE with the help of the Richard Kobler, a mathematician and engineer who had escaped Nazi Germany.\(^{81}\) After Kobler’s work, a variety of funders (including the Carnegie Corporation and the ONR) paid for a costly installation of the new equipment at Hamden Hall in 1960.\(^{82}\) In 1963, Moore reported that he had received “600 visitors” to the installation over the past three years, most of whom were either behavioral scientists or professional educators.\(^{83}\) The film of his daughter Venn and the *Time* interview were produced during these early years, just before the ABC and CBS recordings and Project Breakthrough.

In these venues, the ERE booth became a viable intervention into the “poverty environment” because it was a locus for scientific inquiry into the nature of learning that proved useful to logically minded social scientists while also providing access to images of black children housed with care by experts.\(^{84}\) Beck would ask in 1966, “Can 4-year-olds, the children of illiterate parents, teach themselves to read and touch type—voluntarily, without pressure, and motivated only by the intrinsic pleasure...
The ONR electronic logic puzzles provided programmers with a model for how to write programs that could manipulate logical theorems in ways analogous to human minds while also providing social scientists with techniques for writing programs that borrowed from play-forms the animating effects of the autotelic sense. The Microlaboratory provided an example of how to use electromechanical equipment to isolate users from unstructured social intercourse in order to induct them into novel language groups. The ERE audio-keyboard relay was thought to be more structurally sound than the sonic commons existing in Chicago’s Cabrini-Green housing project or Pittsburgh’s Hill District. Its program and booth managed the internal network dynamics of insurgent social forms by recontextualizing them within the relays of a play-form programmed, soundproofed environment.

**Billy in the Experimental Cubicle**

The talking typewriter isolation booth thus set the stage for a theatrical rendition, filmed through the porthole, of the emergence of the child of the coming computer age. The talking typewriter was the object through which the autotelic sense came into view for a specific set of historical actors as a workable material suited to designing the future look of American democracy as a collectivity of rigorously individuated hypothetical children. The abstractions of fun housed by the ERE provided Americans with a stage on which to work out the gestural repertoire of a newly color-blind version of technocratic liberalism. The social life of the ERE as a televisual, filmic, and photographic event demonstrates how the race neutrality of fun mapped onto the race neutrality of neurophysiological developmentalist theories of learning.

The race neutrality of the science of fun was part and parcel of neurophysiological developmentalism, the belief that learning processes effect brain structure. Neurophysiological developmentalist psychology went beyond the claim that genetic, in utero, hormonal, and nutritional factors shape the neurological correlates of mental capacities, arguing instead that the organism’s interactions with its environment changed neural and mental structures. Learning, that is, shaped the brain.
To test this hypothesis, the neuropsychologist Donald Hebb and his colleagues began testing Scottish Terriers to see if a postnatal captivity in pure darkness and soundlessness would prevent the dogs from behaving normally after release from captivity. Would the confined dogs develop normal problem-solving capacities? No, they would not. The capacity for learning was itself something that developed through sensorimotor engagement with the environment. Without “feedback” linking paw and eye movements to alterations in the environment, there was nothing to inform the growth of neurons regarding relevant and irrelevant responses to input. Learning to learn took place only in responsive environments. The choice to house the user in an isolation chamber was inextricable from this apparatus of sensory deprivation.

Moore’s design for the ERE is remarkably similar to the floor plan and circuit diagram of experimental cubicles designed by American neurophysiological developmentalists in the 1950s—down to the last details of the automated registries of test-subject behavior, closed-circuit monitoring channels, one-way mirrored observation windows, individually air-conditioned booths, and the insistence on featureless interiors of research contexts: “the [ERE] booth interiors are free of the attention-grabbing rococo patterns and whirligigs so typical of nursery and elementary classrooms.” While the “experimental cubicle” was featureless, the lights were always on. A visor blurred the vision of the research subjects while a form-fitting pillow muffled the sound of a fan and an air-conditioner humming in the background. Placed in the restricted environment, the subjects hallucinated during the twelve-, twenty-four-, or forty-eight-hour durations of their isolation. They saw things “like animated movie cartoons”; heard things like “a choir ‘in full stereophonic sound’”; and felt things: “reaching out to touch a doorknob in his vision, [he] felt an electric shock.” They “seemed to be ‘having dreams’ while they were awake.” Bell Systems’ film division animated these hallucinations for public broadcast as the 1958 television special *Gateways to the Mind*.

Researchers explained that the deprivation apparatus originated in a study of British radar operators numbed to the presence of U-boats by the “rigidly
monotonous environment” of the rotating scan beam. Sensory deprivation research experimented with the minimal conditions of coherent responsivity. As the loop between the computation of ballistic trajectories and the perceptual discernment of enemy blips began to occupy the field of ludic televisuality, dreams and electrical media melded into a foggy unfocalized screen time muffled in white noise and air-conditioned control-room isolation chambers. Arun Saldanha uses the phrase “psychedelic whiteness” to name the “viscosity” of bodies temporarily inhabiting abstract, spaced-out affects. Abstraction, in this sense, allows bodies to cluster in silent complicity with absent sovereign authorities in the face of otherwise demanding differences. We could extend that observation to the fact that screen-accommodating architectures attract bodies around clip-in access points to an always-on micro-economy of self-critical surveillance and time-critical positioning operations. When the ERE was chosen for Project Breakthrough, that device plugged the apparatus of sensory deprivation research into the rapid-deployment clip-on architectures of the new educational facilities laboratories. The white-noise atmosphere of the responsive environment was a utopic surround built to study the pathological sounds of boisterous sense-deprived responsivity.

These schematic floor plan and circuit diagram resemblances are only one contact point between the ERE and sensory deprivation research. The discursive drift of the term deprivation was just as pervasive as the floor plan of the sensory deprivation chamber. When, in 1963, Moore dismissed the terms social-cultural deprivation and retardation as necessary academic markers for the neurophysiological developmentalist nomenclature of his day, he was pointing to the discursive contact points where deprivation crossed from sensory deprivation to the theory of poverty culture as a form of maternal and cultural deprivation. Deprivation came to mean “cultural deprivation,” “psychosocial” outcomes of “linguistic deficits” in black households, “maternal deprivation,” and even “sensory deprivation” caused by the living conditions of dilapidated dwellings in black neighborhoods.

When the ERE appeared on public broadcasts, the televiusal theater staged groups of women around a seminar table listening to African American mothers report to the viewing public their successes with motor-skills training techniques for infants. These play-training seminars flowed into an ERE segment, a visit to the design laboratory of Creative Playthings, and Soviet experiments with babies attached to electroencephalograms. When the Johnson administration toured an exhibition titled Education USA (designed by Moore) behind the Iron Curtain, they made the user of electromechanical
teaching machines the showpiece marionette for *Amerika* magazine’s mock-up of the new electromechanical learning environment. At the end of the 1960s, the ideal user wore Lurex and a pixie cut. This user was an animated photographic superposition theatricalizing the coming age of the personal computer on the world stage. Superimposed exposures connected the various apparatuses of the electromechanical experimental cosmos. The glimmering poise of the *Amerika* model’s purposeful motions connected patchwork components that would later become the functional units of programs running on microprocessors. The porthole of the ERE study pod likewise provided a window onto the motions and response patterns of the future user. The ERE was more than a device. It was a model of proper responsivity—a *propter nos* by which a new laity performed telematic allegiance to source points of well-ordered, self-replicating activity—that allowed its interpreters to refigure responsibility for youth and the oppressed in terms of a race- and class-neutral design program.

The talking typewriter project report was titled *Autotelic Responsive Environments and Exceptional Children*. By defining a child as “exceptional,” Moore meant that the “retarded” and “gifted” children whom Hamden Hall took on (in addition
to the normal class) were exceptions to the expectations of adults. Adults interpreted acceleration and retardation as developmental pathologies. Exceptional ERE learners were either black students classified as “educable retardate” by social workers and child psychologists or white students classified by their parents as “wunderkind.”

Moore’s first publicized casework with members of the black community in Hamden concerns Billy, “a light-colored Negro,” who came to the ERE at age six. According to evaluations by his doctors, his IQ was seventy-two—on the boundary between “dull normal” and “educable retardate.” He had been asked to leave his former primary school because he disrupted class and failed to perform the tasks requested of him. Moore visited Billy’s home:

The eight members of Billy’s family share five rooms in a low-income row house—a reasonably large living room (with a record player and a monstrous T-V set), a large kitchen, and three bedrooms. There are three older boys in their middle teens and Billy and his younger brother and sister, ages 4 and 5. The family is crowded but the apartment is spotless and tastefully decorated. There is a bookcase nearly full of books topped by a complete set of super-market encyclopedias. At present, the family is wholly self-supporting, though off and on in the past it has been on welfare. Billy’s father, a small, meek, self-effacing person, is an unskilled laborer who generally works in construction. A social worker, who has known the family for years, classifies the whole family as dull normal.

A monstrous TV and pop encyclopedias were the trappings of a media environment not totally behind the curve of the mid-century hi-fi home with its creative playthings. But what did this home visit, and Moore’s media-environmental evaluation, have to do with the ERE? Part of an answer can be found in records we have of the kinds of lexical borrowings that the booth attendants took initiative to program onto the ERE’s 6-bit magnetic cards for Billy’s spelling sessions. Which words from home did they choose for him to spell out? The answer captures their “aesthetic sense”—to recall Moore’s term for the attendants’ intuition of the ERE learner’s mind-set—of how Billy’s homelife impacted the internal drama of his learning process.

Although Moore did not diagnose family problems, he did suggest that Billy had come to play the fool at home. Billy defied his dominant mother and, when he was chastised, the others goaded him on—for they lived out their defiance of her through him. Billy’s mother insisted Billy was not stupid: he is “stubborn and lazy,” she said. On a road to recovery from misdiagnosis and wrongful dismissal, Billy got mad one day
and told the typewriter to shut up. The booth attendants learned that Billy had been in trouble with his mother for masturbating. The next day he yelled at the ERE again and claimed that it was broken. The attendant spelled “P-E-N-I-S” over the closed-circuit audio connection and programmed the ERE for Billy to spell it out: “He typed the word ‘penis’ twelve times with manifest enjoyment.”

Moore’s citation of Billy’s mother’s chastisements, and Billy’s typewritten manifestation of self-enjoyment all blur together in the unresolved archive of the ERE sessions. When asked to tell a story for the magnetic drum, Billy said, “When my dad took the prayers away, my mother got sick and died.” That story never made the Lab Record. By the time he left the ERE program, Billy was back in a normal classroom, his IQ scores had improved, and his mother was vindicated publicly in her convictions: “Billy is not dumb, he is simply a ‘stubborn and lazy’ child who needs a good whack,” echoed Moore.

The ERE’s monitoring system provided Moore and Billy’s mother with the documents they needed to prevent Billy from being placed in the remedial track. (To this day, the remedial learning computer lab occupies a liminal zone where teachers can attempt to produce evidence of learning before aberrant behavior and bad grades land children in a pharmacologically mandated pipeline to prison.) The ERE’s isolation chamber was a neutral zone from which to gather information through channels unhindered by the teacher, psychiatrist, and social worker who would have shunted Billy aside to preserve the acoustic purity of the classroom. Radical school reformers and disability activists took note of this success.

Billy’s story, with photographs of other ERE learners, appeared in the source book PsychoSources. Printing the story of Billy alongside reviews of Seymour Papert’s early work with the LOGO programming language, PsychoSources connected Moore and the ERE to the print culture of countercultural computing by acknowledging and replicating the formatting of the Whole Earth Catalogue—a book that Turner has shown to have been enormously influential in the dissemination of technonportunistic personal computing ideology. The story of Billy also appeared in the collection Radical School Reform beside texts by McLuhan and the widely read activist educator and champion of black schoolchildren Jonathan Kozol. Disability activist and child psychologist Burton Blatt reported on his involvement with an ERE project in Boston in A Field Demonstration of the Effects of Nonautomated Responsive Environments. He found that the ERE could be put to use gathering evidence of learning in children diagnosed as...
“retarded” in black neighborhoods. Blatt’s work on the “education of intelligence”—relying on the example of the ERE in multiple book-length reports—was instrumental in the redefinition of autism through new diagnostic techniques and therapies that rendered retardation obsolete as a clinical concept. Moore had seen deafness as a sensory deprivation study, recommending technological intervention at infancy to preempt the cognitive drawbacks of hearing impairment. Blatt saw children who did not learn at school as cases of systematic neglect, demanding a different sort of environment for the individualized nurture of each child. Fun was a datum for the diagnostic technique that outmoded retardation as too coarse in its definition of mental difference and too blunt in its conceptualization of learning ability. The ERE, in its discursive rechanneling through countercultural computing and radical school reform, connected the idea of a redistribution of shelter for the hypothetical child to the project of dismantling the diagnostic timeline that defined race and ability as out of joint with normalcy and responsibility.

What Moore’s and Blatt’s work demonstrated was that the ERE was inextricable from a wider debate over the educability of black youth during the 1960s. *The Negro Family* is the central document of that debate in that it sought to countermand arguments that race determined potential for intelligence by arguing that the “matriarchal” black home prevented boys from pursuing academic achievement. The televisial theatricalizing of the event of learning in the ERE booth was a manifestation of the wish to reengineer the kinship structure of black social life through the study pod. In this same vein, sociologist Richard Wolf had set out at the Testing Problems conference to address the “environment” of learning not in terms of acoustic cocooning or models of programmed content but in terms of the motivation to achieve present in the nuclear familial unit. Isolating fun was not only about isolating trajectories of programmability within the overall makeup of the objective possibilities of computational media. Deploying fun as a logical play-form component in the designer’s toolkit of clip-on parts was also about isolating the autotelic sense from the environments that supposedly resulted in the marginalization of African Americans on the test-score ledgers of the meritocratic state.

The Cook County Department of Economic Opportunity also produced a film documenting the use of the ERE in Project Breakthrough. That film shows children bused in from Chicago’s Cabrini-Green housing project to ERE installations. Titled *The Secret Weapon*, the film begins with the flashing title scrolling downward in front of images of nameless children filmed through the ERE portholes. A male voice, accompanied by a thudding drum, announces that “what you are
Looking at just might be the secret weapon in the War on Poverty.” The children? Or the booth? An expert teacher from the Chicago Board of Education, Joanne Tracy, describes the ERE as the psychophysical planner of educational environments: “the talking typewriter is a computerized typewriter that has many aspects to it. It has a keyboard which the child will touch, which is kinesthetic. It has a voice, audio: the child may hear on it. It also has a screen, which the child may see.” Pamela Jung, a booth assistant from the Hamden Hall project, explains that “it eliminates most social stigmas, or I should say every social stigma. The child is not ashamed when he does not catch on, he makes it a game, and it’s infinitely patient.” The project’s director ends the film by explaining how the old Bunte Candy Company building, converted at the turn of the century into the largest Prairie School building ever constructed (the Westinghouse Vocational High School), would soon have its ground floor torn out and retrofitted with a new space suited to powering an installation of ERE booths. The project of altering school architecture for the sake of accommodating a patchwork of electromechanical teaching equipment was inextricable from the application of neurophysiological theories of the learning process to the design of poverty-intervention programs.

Could we say that Billy was a fetish, as Haraway suggests was the case with other instances of the infant test subject in the psychology of Hebb’s generation? Would it then be the case that he was the medium through which bureaucrats and legislators facilitated their flight from urban welfare? To do so might be to recall, however partially, one “flight of ideas” that was to become typical of the coming laity of personal computing. On the other hand, it was through Billy that the tangle of...
intimacy between him and his mother, and the very names she chose for him, entered the relays of the protopersonal computer’s apparatus of inscription. The personal computer has been presented as an ill-posed question—a “red herring,” as Alan Kay once called “user-friendliness” (to recall Bardini’s research on that term). Kay named Moore and the talking typewriter in his seminal 1972 paper “A Personal Computer for Children of All Ages” when he stated his view that the “differentiating, abstracting and integrating activities of the child” needed room to flourish for the personal computer to become a utopian enclave: “It is just this realm of apparent nonsense that must be kept open for the developing minds of the future.” For Pias, the illiteracy of the deficient user marks a historical rupture between the real men behind the machines and the digital culture that followed. The relentless prioritization of what he calls “commensurability” between the computer and an all-too-human user has been written into computer history through the predominance of hardware for graphics processing, coding for network-optimized formats, and in the faith that artificial intelligence let loose on user data could turn distant relatives of a problem-solving heuristic into an errorless economy. How could partial histories engage these materialized ontologizations of real-time rendered objecthood, networked-optimized audiovisual file formats, and wishes for God AI to help us learn to ask of computation what has been forgotten already? Can they teach us to unlearn the flight of ideas that latches onto the avoidance strategies of human stopgap ratio- nales and the politically neutralized subjectivity of properly performed aptitude? Every so-called personal computer or mobile device bears the trace of this flight into the abstractions of fun and their circumvention of the question of what ethical and aesthetic orientations dreams of friendly computing tuned out.

The ERE was a fragment in an expansive technological dissemination that clearly articulated neurophysiological developmentalist psychology with the postwar state-rebuilding project. The domestication of the computer began with this preparation of the ground: electromechanical pedagogy redrew the line between the oikos and the “The Wild Boy,” which was now writ with every new deployment of clip-in study booths for nurturing the universal plasticity of neural networks in for- mation. Universalizing neurological definitions of the human family reinscribed the line between the black home and the state. They installed an apparatus that encased the possibility of youth, pulling the incipient moment of alphabetization into the home of the legitimate economy now filtered through the logic of attentional drift at risk of zoning out lest the white-noise abstractions of play-form programming organize purpose-
ful reactions. The domestication of computing began with this process of inscription, which carved a line between the natural state of proper developmental progress and the ill-equipped human factor lagging behind the trend. The science of fun transformed the controlled infrastructural development of computing into a medium through which the domestic sphere, the state, and entrepreneurial networking could be rearticulated in terms that were rhetorically humanist, euphemistically antiblack, and psychedelically white while also creating a platform for a globalized image of benevolent and racially tolerant technological superiority. Perhaps in the weird translation of Billy’s relationship with his mother into Moore’s and Blatt’s refusal of deprivation explanation schemes we can hear a mother and her boy playing the double-bind of the new laity of personal computing: bused in, caught on film, seeping through the cracks of a two-way mirror that cannot help admit that their complex dance in the theater of white generalities unworked the time line of proper development.
Notes
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3. Two news reports document this page of asterisks typed by the young student. C. Gilmore, “Omar Khayyam and His Talking Typewriter,” Saturday Evening Post, 20 November 1965, 41; and Beck, F1. Beck explains that she based her report on a film of Venn by Moore, which I believe to be Early Reading and Writing, pts. 1–3, dir. Omar K. Moore and Alan Ross Anderson, Basic Education (Hamden, CT), 1960. The only remaining partial copy of this film (that I know of) is a digital copy (which contains no production or publication information) that I obtained thanks to the generosity of Mark Meysenburg, professor of information science, Doane University, NE. Moore donated what is perhaps one of the few existing talking typewriters to Doane, his alma mater. Whether that digital file is indeed Early Reading and Writing is my educated guess based on bibliographic material and written descriptions of the film. The copy from Doane does not contain the asterisks sequence reported on by both Beck and Gilmore. For a document in which Moore narrates a series of clips from a long career of making films of his experiments, see Omar Khayyam Moore, “On Responsive Environments,” in New Directions in Individualized Learning, Abington Conference ’67, April 23–25, 1967 (Pittsburgh: Learning Research and Development Center, 1967), 8–10. Francine E. Jefferson, one of Moore’s collaborators from the Hill District, continued this filmmaking practice. Francine E. Jefferson, “Notes on Sociological Practice: Evidentiary Films,” Sociological Practice 2, no. 1 (Spring 1977): 62–67.


7. Gilmore, 41.

8. Gilmore, 41.

9. See Friedrich Kittler’s extended discussion of the work of late-nineteenth-century German psychologist Herman Ebbinghaus’s experimental work on the “difference between sense and nonsense.” Friedrich A. Kittler, Discourse Networks 1800/1900 (1985), trans. Michael Metteer with Chris Cullens (Stanford, CA: Stanford University Press, 1999), 209. Bernhard Siegert explains that “starting in the 1970s Kulturtechniken [cultural techniques] also came to refer to elementary Kulturtechniken or basic skills such as reading, writing, and arithmetic.” Research on the basic mechanisms of elementary transmission in human and machine—from learning to read to the mathematics of communications—broke with the “middle-class understanding of culture, linking it to humanist educational imperatives,” by alternatively “establishing a link with the older, technologically oriented understanding of culture.” Bernhard Siegert, Cultural Techniques: Grids, Filters, Doors, and
Other Articulations of the Real, trans. Geoffrey Winthrop-Young (New York: Fordham University Press, 2015), 10. Cornelia Vismann provides an account of how such older elementary techniques work in the case of ancient domestication processes: “To start with an elementary and archaic cultural technique, a plough drawing a line in the ground: the agricultural tool determines the political act; and the operation itself produces the subject, who will then claim mastery over both the tool and the action associated with it.” Cornelia Vismann, “Cultural Techniques and Sovereignty,” Theory, Culture, and Society 30, no. 6 (2013): 84.


11. Beck, F1; and Gilmore, 40.
20. Moore, Autotelic Responsive Environments, 18. The importance of Moore’s work on the ERE for Seymour Papert and Alan Kay, the renowned
and widely recognized designers of the user-friendly LOGO and SMALLTALK programming languages, is a story that lies just beyond the scope of this paper, though personal computing is central to its thesis. For Kay’s discussion of Moore, see Alan Kay, *A Personal Computer for Children of All Ages*, internal document (Palo Alto, CA: Xerox Palo Alto Research Center, 1972), n.p. [pp. 2, 4].


29. On plasma displays and time-sharing, see Noble, *The Classroom Arsenal*, 100, 106–8. On radio clubs, schools, and the manufacturing infrastructure for vacuum tubes and transistors, see Christophe Lécuyer, *Making


31. On learning in machines, see Wiener, Cybernetics, 43.

32. On learning in organisms compared to cosmic order and chaos, see Wiener, The Human Use of Human Beings, 12, 94. See also 169, 174–75, where Wiener offers a comparison of animal combat, concluding that “ontogenetic learning” in reptiles is lesser than that of mammalian ontogenesis because the latter has deposited in the “phylogenetic learning” of genes a greater investment in more elaborate nervous systems.


36. For an important critique of the mainly technological agenda of PLATO’s research and development, see Nobel, *The Classroom Arsenal*, 98–103. For a recent account based on participant oral histories, see Dear, 26. For an analysis of PLATO and computers in education as a “social movement” laying the groundwork for personal computing, see Joy Lisi Rankin, *A People’s History of Computing in the United States* (Cambridge, MA: Harvard University Press, 2018), 147–54.


43. Pias, *Computer Game Worlds*, 192–93, 110–23, 318–19. For comments that bring in 1960s social unrest (to then take another direction), see Turner, *From Counterculture to Cyberculture*, 34–35 and 97 (on the Students for a Democratic Society, the Black Panthers, and black power), 45–51 (on cybernetic art worlds). These authors can hardly be faulted for carefully delimited scholarly work. I am simply pointing out the inadmissible background structured by their archival and conceptual limits. For oral history documents from 1960s edutainment designers, see Mizuko Ito, *Engineering Play: A Cultural History of Children’s Software* (Cambridge, MA: MIT Press, 2009), ch. 2.


54. For an example of intelligence tests used to remap race and ability, offered in the context of contributions to the 1964 conference at which Moore presented on the technological erasure of deafness and Richard Wolf presented work on the evaluation of home environments, see Fischer, “Social Class and Cultural Group Differences,” 114.

55. Burton Blatt and Frank Garfunkle, *The Educability of Intelligences: Preschool Intervention with Disadvantaged Children* (Washington, DC: Council for Exceptional Children, 1969). For a summary of the debate between nativist and environmental theories of intelligence from the early 1960s, as that debate pertains to research using computers in educational programs designed to test the extent to which “retarded” students were educable, see J. McVicker Hunt, *Intelligence and Experience* (New York: Ronald Press, 1961), esp. 98–99 (on the work of Donald Hebb), 65–108 (on “Information-Processing and Experience” and the link between deprivation research and Simon and Newell); and Hudson, 2.

56. The phrase is from Haraway’s critique of “the nuclear family apparatus” used by Harry F. Harlow to study the effects of “enriched environments” on the collective life of rhesus monkeys. That apparatus was the inverse of Harlow’s “ice-cold mother” (a wire mesh torture rack for infant monkeys), which he used to study “family deprivations” in primates. See Haraway, *Primate Visions*, 240–41.


59. Spivak, 1, 5, 11, 517 n. 57.

60. For the black body as a third term facilitating the European middle class (through the use of instruments of computation), the establishment of a new laity with claims on the redistribution of sovereign authority, and its legitimate prosthetics of force implementation, see Sylvia Wynter, “1492: A New World View,” in *Race, Discourse, and the Origin of the Americas: A New World View* (Washington, DC: Smithsonian Institutional Press, 1995), 9–11 (for the “triadic model” by which Europeans first performed the “deconstruction of mainstream Christian geography” by inventing the moral economy of civilizing missions), 16, 19, and 25 (for the dangerous relation of “mathematics”
to “divine guidance” in the case of the “socially mobile merchant/artisan-cum-mapmaker category” of middle-class white Europeans, 25 and 31 (for the “poetics of the propter nos”). For the equation of “early environment” with a postnatal home environment, see Hudson, 5. For domestication as the technique of line drawing that constitutes a “political act” of inscription separating the home and the wild, see Visman, “Cultural Techniques and Sovereignty,” 84.

61. Freud suggested that “[l]ack of orientation is the whole secret of the flights taken by our imagination in dreams, and lack of critical reflection and communication with other people is the main source of the unbridled extravagance exhibited in dreams by our judgements as well as by our hopes and wishes.” Sigmund Freud, The Interpretation of Dreams, trans. James Strachey (New York: Basic Books, 2010), 81 n. 1. Though a much longer discussion of this quotation is warranted, I mean to point to Kittler’s interpretation of the “flight of ideas” in Discourse Networks 1800/1900. The technical media of the late nineteenth and early twentieth centuries, while creating a new relation with the real by statistical analysis of automatically recorded chaos or noise, also impelled new attempts (especially in the psychology of children’s language learning) to use experimentally induced disorientation as a laboratory technique: “Psychophysical experiments impose slogans and catch-phrases until the tortured disappear into glowing depths or render up the physiology of cultural practices,” Kittler, 220–21. The connection between induced disorientation and technologically assisted reorientation is at stake. “Utopian borderlands” is Haraway’s phrase for the contested status of precisely such contexts where experimentally induced distress was used to work out fundamental distinctions between nature and culture. See Haraway, Primate Visions, 65. (For one of many summaries of the book’s suggestion that in deepening “boundary disputes” the utopian imaginary can come to respond with more than the wish for perfect control and communication, see 331.) For a Cold War deployment of telecommunications infrastructure as relief from lack of orientation and communication in black neighborhoods in New York, see Light, From Warfare to Welfare, 163–94.


64. For more-detailed descriptions of this kit of parts, see Moore and Anderson, 702–14.

65. Moore and Anderson, 702.


68. Kennedy, 29; and Edwards, The Closed World, 75–111.


70. Kennedy, 29.

71. Kennedy et al., 255.

72. The revision of these experiments funded by the ONR Group.


78. In a diagram illustrating Moore’s article on Simmel, the “deontic boundary” is a rule system that protects the realm of play from interference, just as the ERE booth protects the child typist from kibitzing. Moore, “Simmel on the Ratio of Subjective Values to Objective Cultural Possibilities,” 212.


83. Moore, *Autotelic Responsive Environments*, 9 n. 3. The behaviorist B.F. Skinner cites Moore and Anderson in his late work *Verbal Behavior*. Moving beyond the puzzle boxes he had used to study the learning behavior of animals, Skinner saw Moore and Anderson as allies in his effort to treat

84. Hudson, 6.


89. Richard Held, “Plasticity in Sensory-Motor Systems,” *Scientific American* 213, no. 5 (November 1965): 84, 84–94. This tradition of experimentation still persists in contemporary analytic philosophy of mind. That tradition has warded off the critique of “sensorimotor chauvinism” (which states that immobile subjects would be less than human on this account of humanness as the capacity for meaningfully directed movement) by claiming that the only capacity defining humanness is the ability to perceive based on minimal saccadic movements. Even such minimal capacity for movement can produce the cortical activity qualified by sensory-motor theorists as experience. See Alva Noë, *Action in Perception* (Cambridge, MA: MIT Press, 2005), 26–28.

90. Moore, *Autotelic Responsive Environments,* 7–8. The floor plan and circuit diagram of Moore’s responsive environment can be found in some of the first human experiments in sensory deprivation research. Woodburn

91. Heron, 52.

92. Heron’s experiments are based on the well-respected work of Donald O. Hebb with McGill University’s Allen Memorial Institute. D. Ewen Cameron conducted the CIA brainwashing experiments known as MKULTRA based loosely on Hebb’s research; see Lemov, 201, 212, 188–221.

93. Heron, 54.

94. Heron, 54.

95. *Gateways to the Mind*, produced by Owen Crump, Bell Telephone Systems and Warner Bros., 1958, 35 mm film. For animations written and directed by Chuck Jones and designed by Maurice Nobel see 00:41:00 to 00:45:00.

96. Heron, 52.

97. Arun Saldanha, *Psychedelic White: Goa Trance and the Viscosity of Race* (Minneapolis: University of Minnesota Press, 2007), 5–6, 8–9, 11–20; emphasis in original. The study pod is an extension of the use of psychedelics in the transcendence of the body and the creation of connections with nonwhite bodies (the de facto outside of white norms) that then facilitate the re-creation of whiteness in the emergence of new forms of white collectivity. But, in contrast to Saldanha’s account, the “man behind the machine” is controlling these disarticulating mental states in others rather than using them to instigate such altered states in himself. Nonetheless, the apparatus is creating the contact point with nonwhite bodies that Saldanha, citing Michael Taussig, identifies as central to the specificity of colonial subjectivity. See also Michael Taussig, *Shamanism, Colonialism, and the Wild Man: A Study in Terror and Healing* (New York: Columbia University Press, 1987). For thoughts on the relation of cybernetics to disembodiment, see Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999), 7.

98. The ERE was one study pod among many. If space permitted, we could track the floor plan and circuit diagram of sensory deprivation research to the modular architectures of postwar school building construction kits, language laboratories, and programmed instruction booths. For a well-known commentary on perhaps the most influential of these architectural building kits, the Schools Construction System Development (SCSD), see Reyner Banham, *The Architecture of the Well-Tempered Environment* (Chicago: University of Chicago Press, 1969), 61, 216–17. For Moore’s work as documented and supported by the same research group (the Educational Facilities Laboratories) that supported the SCSD kit, see Paul Abramson, *Schools for Early Childhood* (New York: Educational Faculties Laboratories, 1970), 30–33.


102. For play-training home visits and seminars, see the section of “From Cradle to Classroom, Part 1” starting at 00:09:00.

103. For play training flowing into the ERE, the Creative Playthings design
laboratory (Princeton, NJ), and Soviet electroencephalograms of babies in nursery school, see “From Cradle to Classroom, Part 1,” 00:12:30 (for the ERE), 00:14:47 (for Creative Playthings), 00:17:16 (Soviet baby EEGs). See also The Saga of Western Man, 00:32:42 (for the talking typewriter at Hamden Hall).


105. Moore, Autotelic Responsive Environments, 2 n. 1.

106. Moore, Autotelic Responsive Environments, 40, 45; emphasis in original.


108. Moore, Autotelic Responsive Environments, 32.


112. Moore, Autotelic Responsive Environments, 32.

113. Moore, Autotelic Responsive Environments, 32.

114. Moore, Autotelic Responsive Environments, 34.

115. For an analysis of attention deficit disorder and its consequences for the criminalization of black youth, see Nancy A. Heitzeg, The School-to-Prison Pipeline: Education, Discipline, and Racialized Double Standards (Santa Barbara, CA: Greenwood, 2016), ch. 5.

116. See Evelyn Shapiro, ed., PsychoSources: A Psychology Resource Catalogue (Toronto: Bantam and Communications Research Machine, 1973), ii (for acknowledgment of The Whole Earth Catalogue), 22 (“Billy and the Autotelic Environment” clipping; the photograph is almost certainly not of Billy as PsychoSources postdates the 1963 experiments by ten years), 29–30 (for Papert, LOGO, and the PLATO system). See Turner, From Counterculture to Cyberculture, 82–91, 111–12, for a close analysis of the design of The Whole
Earth Catalogue and for oral history notes on the influence of the catalogue on team members at Xerox PARC.


119. Blatt, A Field Demonstration, 7; Blatt and Garfunkle, 89–97; and Burton Blatt, The Intellectually Disenfranchised: Impoverished Learners and Their Teachers (Washington, DC: Department of Mental Health, Division of Mental Hygiene, 1966), esp. 120–28. Garfunkle was special education director at the New England Head Start Research and Evaluation Center, Boston University, at the time he published The Educability of Intelligence with Blatt. For the longer story of the deinstitutionalization of mental retardation, see Gil Eyal et al., The Autism Matrix: The Social Origin of the Autism Epidemic (Malden, MA: Polity, 2010), 111–12, 114.


121. For the wider context of this refinement process through family advocacy and the activist work surrounding conditions in mental hospitals, see Eyal et al., 111–12, 114.

122. Daniel Moynihan, The Negro Family: The Case for National Action (Washington, DC: Office of Policy Planning and Research, U.S. Department of Labor, 1965), 29. “There is absolutely no question of any genetic differential: Intelligence potential is distributed among Negro infants in the same proportion and pattern as among Icelanders or Chinese or any other group” (35). What, then, is distributed differently? The “distribution of achievements” (3) and the “distribution of desertions” (18). Resolving this distribution problem is Moynihan’s objective, in the name of which he proposes the elimination of black “subculture” and, with it, the “cycle of poverty and deprivation” that he believed to be the result of lack of male leadership in black neighborhood social network topology (30). For a deconstruction of The Negro Family as a reinscription, by way of the medicalization of the black body, of the institutions of slavery that attempted but failed to destroy lines of heritage and bonds of intimacy in black families, see Hortense Spillers, “Mama’s Baby, Papa’s Maybe,” 67–68. For the organized resistance of the Black Panthers to specifically neurophysiological developmentalist deployments of sensory deprivation research as an antiviolence remedy in the 1960s, see Alondra Nelson, Body and Soul: The Black Panther Party and the Fight against Medical Discrimination (Minneapolis: University of Minnesota Press, 2011), 153–54, 159–64. For “deprivation” in a number of other War on Poverty education programs, see Mical Raz, What’s Wrong with the Poor? Psychiatry, Race, and the War on Poverty (Chapel Hill, NC: University of North Carolina Press, 2013), chap. 2.

program for an interview-based evaluation of parents’ language ability and financial planning, see Blatt, *A Field Demonstration*, 80–81. Blatt misspells Wolf’s name as “Wolfe,” but is citing the 1964 *Invitational Conference on Testing Problems*, which also featured a paper by Moore. See Moore, “Technology and Behavior.”

124. *The Secret Weapon*, from 00:00:01 to 00:00:30.

125. *The Secret Weapon*, from 00:03:40 to 00:04:10.


127. *The Secret Weapon*, from 00:10:00 to 00:10:20.


129. See Kittler, *Discourse Networks 1800/1900*.


