

Handbook of Computer Game Studies

edited by Joost Raessens and Jeffrey Goldstein

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SLOTS OF FUN, SLOTS OF TROUBLE: AN ARCHAEOLOGY OF ARCADE GAMING

Erkki Huhtamo

By gosh—it is a pinball machine!

—Steve “Slug” Russell, one of the creators of Spacewar

In *The pilgrim in the microworld* (1983), an early, unjustly neglected analysis of electronic gaming,¹ the sociologist and musician David Sudnow compares his struggle to master *Breakout* with an Atari home video game console to his long-term efforts to learn to play the piano.²

Before, the piano was the quintessential human instrument. Of all things exterior to the body, in its every detail it most enables our digital capacities to sequence delicate actions. Pushing the hand to its anatomical limit, it forces the development of strength and independence of movement for fourth and fifth fingers, for no other tool or task so deeply needed. This piano invites hands to fully live up to the huge amount of brain matter with which they participate, more there for them than any other body part. At this genetically predestined instrument we thoroughly encircle ourselves within the finest capabilities of the organ. (Sudnow, 1983, p. 26)

Sudnow’s encounter with video games, which soon developed into an addiction, gave an impetus to a book that is unique. It is still the most detailed description of the psychophysical bind created between the player and the game (and, by implication, the user and the computer). Hardcore gamers rarely feel the need to conceptualize their experiences. Sudnow, however, does exactly this, profiting from his double background as an academic researcher of social interactions and a jazz pianist.³ His detailed account is a mixture between a diary of addiction and recovery, a phenomenological study, and a self-referential literary work, reminiscent—as Grahame Weinbren has suggested—of Samuel Beckett (Weinbren, 2002, p. 182).⁴ Sudnow makes intriguing observations about the medium that

had come to preoccupy his mind and his fingers so unexpectedly:

Punctuate a moving picture? I’m no painter and don’t dance in mirrors. But here I could watch a mysterious transformation of my movements taking place on the other side of the room, my own participation in the animated interface unfolding in an extraordinary spectacle of lights, colors, and sounds. Improvised painting, organized doodling, with somebody doodling against you to make sure you keep doing it. (Sudnow, 2001, p. 23)

Although primarily concerned with describing and analyzing the author’s own relationship with *Breakout*, *The pilgrim in the microworld* also inspires the reader to think about the cultural background of electronic gaming. For if human history has been cultivated, as Sudnow suggests, “through speech and the motions of fingers . . . the tiniest not biggest actions,” video gaming may not be an unprecedented phenomenon. At the very least, it would be linked with the tradition of using keyboards, from playing the piano to tapping the keys of a “Hughes machine” (a telegraphic apparatus with piano-like keyboard) or the typewriter. However, Sudnow does not elaborate on the historical and cultural ramifications of his observation. In fact, the “keyboard tradition” can be considered part of a wider phenomenon, that of interfacing humans with artefacts of all kinds. Although the history of such interfacing goes back thousands of years, its significance began to grow enormously in the nineteenth century as a result of the industrial revolution and its social, economic, and cultural consequences. The introduction of large-scale machine production was accompanied by an avalanche of different devices that provided amusement, including gameplay. Although often mechanically simple (at least if judged against twenty-first-century standards), and limited in their interactive potential, such devices prepared the ground for future applications such as

electronic arcade games. How, why, when, and where this happened is a challenge for scholars. What is needed is an “archaeology of gaming.”

Looking Backward: Beyond Game History

This chapter is a contribution to the cultural and historical mapping of electronic gaming. Its basic premise is at least seemingly simple: electronic games did not appear out of nowhere; they have a cultural background that needs to be excavated. The existing literature on the history of video games has done little toward achieving this goal. In fact, the (hi)story is usually told in a remarkably uniform fashion, built around the same landmarks, breakthroughs, and founding fathers (not a word about mothers!). The history of coin-operated arcade video games is routinely said to begin with the appearance of Nolan Bushnell's *Computer Space* (1971) and *Pong* (1972), that of home games with the introduction of Magnavox Odyssey (1972), the first video game console for domestic use, conceived by Ralph Baer, with Bushnell another founding father.⁵ The main predecessor to these landmarks has been identified in *Spacewar*, associated with the name of Steve “Slug” Russell, but actually created by a group of student-hackers at MIT in the early 1960s, and subsequently improved collectively by other students at the computer science departments of various American universities throughout the 1960s.⁶ The main argument concerning the “prehistory” of electronic games has centered around the status of *Spacewar*—was it really the first video game? Although most seem to agree, there are those who claim that this honor really belongs to a simulation called *Tennis for Two*, created on an analog computer by the physicist William Higinbotham at the Brookhaven National Laboratory in 1958.⁷ Most game historians also have something to say about the emergence of computing as a precondition for the video game phenomenon, yet few of them venture further than that. Stephen L. Kent includes a summary description of the history of mechanical arcade games in his massive volume *The ultimate history of videogames*, yet in most cases “prehistorical” information, if any, has been included “from duty,” rather than from a critical urge to establish (and question) the links with the past.

The current state of writing on game history could be called its “chronicle era.” Books such as Leonard Herman's *Phoenix: The fall and rise of videogames*, Van Burnham's *Supercade*, Steven L. Kent's *The ultimate history of videogames*, and Rusel DeMaria's and Johnny

I. Wilson's *High score!* are mainly concerned with amassing and organizing data.⁸ Whereas Herman focuses on the development of game hardware, Van Burnham's overwhelmingly visual *Supercade* celebrates the games themselves, trying to delineate the elements of a “game aesthetics.” DeMaria and Wilson have organized their volume around numerous “minihistories” of game companies. None of the histories published so far develops a critical and analytic attitude toward its subject. This can perhaps be explained by external factors. Game historians such as Steven L. Kent, Leonard Herman, and Van Burnham (introduced as a “video game junkie” in the sleeve) are all roughly the same age (in their early 30s), and became familiar with electronic games in their childhoods in the 1970s. The same goes for J. C. Herz, Alain and Frédéric Le Diberder, and Steven Poole, whose books deal with gaming history as well, although not as their main goal.⁹ All these writers belong to the first generation that grew up with electronic games; for them gaming became a powerful formative experience. This is both their strength and their weakness. It is a strength, in that the writers are all gamers familiar with their field, and observing it with the eyes of a fan and an insider.¹⁰ It is a weakness, in that they often lack critical distance to their topic and are unable to relate it to wider cultural framework(s), including contemporary media culture.

In this chapter, I excavate some cultural and historical issues relevant for a critical assessment of the emergence of games as an interactive medium. My main emphasis will be the background of electronic games as a manifestation of the human-machine relationship. Although I am fully aware of the complexity of electronic games as a cultural hybrid, I have chosen not to deal with certain of their historical “ingredients,” such as motives from earlier forms of gaming and play and the oral and literary traditions of storytelling. As Gillian Skirrow pointed out in her pioneering study “Hellivision: An Analysis of Video Games” (1986), ancient myths and fables often manifest themselves in games, both in their subject matter and their narrative deep structures. This raises intricate questions about the migration of myths across time, space, and various “media.” It also leads to questions about the roles and functions of myths embodied in games, literature, cinema, and other cultural forms. I leave these issues for cultural anthropologists and literary scholars to explore. Instead, I present the outline of an archaeology of gaming in public spaces, particularly in game arcades. Thus I leave issues such as domestic and nomadic (mobile,

portable) gameplay to a future article. The interplay between public and domestic media consumption is an important issue that deserves a full treatment elsewhere. Although the same games are often adapted from one platform to another, the playing context makes a difference, influencing the nature of the experience, often in relation to other media forms.¹¹

As an interactive medium, the roots of electronic gaming go back to the time of the industrial revolutions of the nineteenth and early twentieth century. Connecting humans and machines was a central cultural, economic, and social issue of the time. The introduction of machines as a new source of power and rationalized mass production led to an intense and long-lasting debate. An impressive overview of the dimensions of this debate is provided by Humphrey Jennings' *Pandemonium* (1987), an extraordinary collage of textual fragments. The book tells the story of the coming of the machine entirely by means of quotations from contemporaries, realizing one of Walter Benjamin's dreams. The use of machines for productive purposes in factories and offices provided a background for the appearance of other kinds of machines, meant for amusement and relaxation. To start with, I sketch the cultural background for the emergence of these "useless" machines. I then concentrate on the public amusement machines—often known as coin-ops or slot machines—dealing with their cultural roles and analyzing the modes of human-machine relations they introduced. There is a wealth of factual information available, thanks to collector-writers such as Nic Costa and Richard M. Bueschel, but far less cultural analysis.¹² Very few writers have elaborated on the relationship between early coin-operated machines and video arcade games.¹³

In the final section I reflect on the significance of these "media archaeological" findings for contemporary media culture and electronic gaming in particular, pointing out connecting links across the fabric of the twentieth-century culture. Although my emphasis is on the ways in which electronic gaming can be related to preceding cultural formations, I am not claiming that the "nature" of video games could be exhaustively explained by the phenomena covered in this essay. There are other influential developments that have been left out, including the impact of the technologies meant for domestic production and consumption. I am not trying to say that phenomena identified in contemporary media culture could be fully explained by looking toward the past. Electronic games and the roles they play in contemporary culture have much that is

unique and unprecedented. Yet, to correctly assess their "uniqueness" media-archaeological excavations of the past may prove to be helpful. All cultural processes consist of interplay between continuity and rupture, similarity and difference, tradition and innovation; only their mutual proportions and emphases vary. Critical cultural analysis should take both dimensions into account.

"The Animal Machine . . . Chained to the Iron Machine"

The notion of a close, near-symbiotic relationship between the human and the machine is often thought to be the product of contemporary culture, saturated by all kinds of devices, both stationary and mobile. As arguably the most widespread application of interactive media, electronic games may seem the ultimate fulfillment of this idea, both in good and in bad. Yet the discourse on linking humans with machines goes further back in time. When it emerged, it was often formulated in a negative sense, seen as a dark side effect of progress. The issue emerged in a world that was undergoing dramatic changes, related to industrialization and mechanization. Beginning in the late eighteenth century, the introduction of steam-powered and mechanical machines into workshops and factories changed the nature of work.¹⁴ In the earlier system of mercantile production, much work had been distributed to skilled craftsmen, who could work from their homes. Not only did they retain their privacy, they could also more or less define their own working pace. With the new machinery, this relative independence disappeared. The workers were gathered at centralized factories where they had to submit themselves to the predefined rhythms and routines of the workplace. The value of skilled workforce began to diminish. Already in the early nineteenth century, the factory itself was felt to turn into one huge machine, with the workers becoming its parts. Around 1815, visiting the mechanized shoe manufactory of "that eminent, modest, and persevering mechanic, M. Brunel," Sir Richard Phillips saw such a human-mechanical machine-hybrid in function:

Every step in it is effected by the most elegant and precise machinery; while as each operation is performed by one hand, so each shoe passes through twenty-five hands, who complete from the hide, as supplied by the carrier, a hundred pair of strong and well-finished shoes per day. All the details are performed by ingenious application of the mechanic powers, and all the parts are characterized

by precision, uniformity, and accuracy. As each man performs but one step in the process, which implies no knowledge of what is done by those who go before or follow him, so the persons employed are not shoemakers, but wounded soldiers, who are able to learn their duties in a few hours. (Phillips, 1817, cit. Jennings, 1987, pp. 137–138)

Not only skilled, but even healthy workers were eliminated. Their role as “gears” in the factory-machine was given to crippled soldiers. In a way the machinery compensated for the deficiencies of their mutilated bodies, serving as a “prosthesis.” Although employing former soldiers could be interpreted as a philanthropic gesture, it might also have been motivated by purely economic motives: the idea of using the cheapest and the most loyal (stable) workforce available. Already in the first half of the nineteenth century, social observers began to pay attention to the fact that workers were in the process of being turned into machines (or machine parts). James Phillips Kay wrote in 1832 about the working conditions in the cotton mills of Manchester: “Whilst the engine runs the people must work—men, women, and children are yoked together with iron and steam. The animal machine—breakable in the best case, subject to a thousand sources of suffering—is chained fast to the iron machine, which knows no suffering and no weariness.” (Kay, 1832, cit. Jennings, 1987, p. 185).

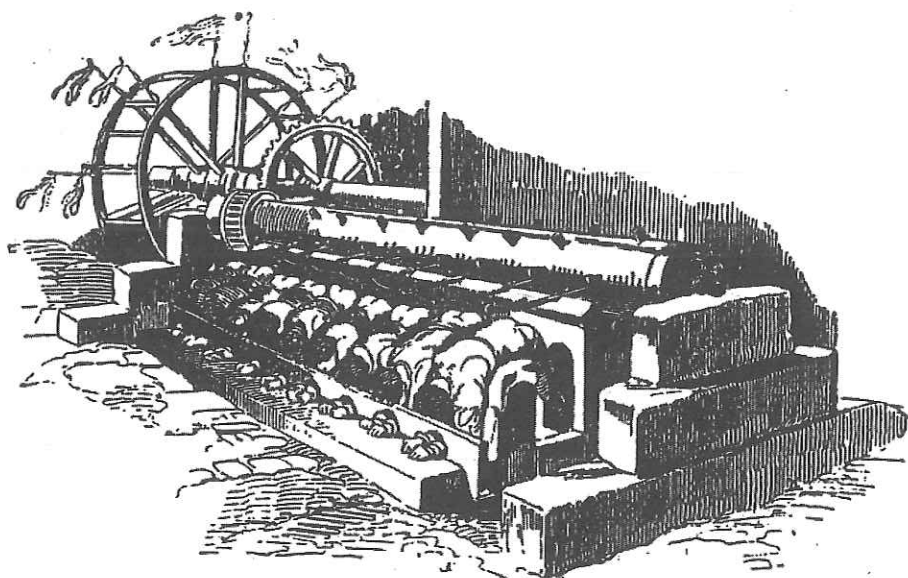
“The animal machine ... chained fast to the iron machine” appeared in other sectors of society as well. From the second half of the nineteenth century, office workers were gradually subordinated to the principles of mechanization as well. They were forced to spend their time tied to new office machines—mechanical calculators, “electric pens” and typewriters, copying machines (or “mimeographs”), dictating machines, telephone switchboards. The workdays were divided into repetitive routines developed after the factory model. As Adrian Forty (1986) explains, the new rationalized ideology of office work was totalitarian in nature and found expression on all levels from the largest to the smallest elements, including specially designed office furniture and automated timecard devices. It is not surprising that the extensive linking of the human with the machine became the subject of fantasies and parodies. Devices such as mechanical “shaving mills,” torturing machinelike photographers’ chairs and feeding machines for workers (featured later in Chaplin’s *Modern Times*, 1936) were imagined. Eccentric applications inspired by the factory assembly line were proposed,

often with a satirical touch. Although some of them displayed liberatory potential, releasing the worker from one’s toiling, most implied a tightening bondage to the machine. One such idea was the automatic “spanking machine,” able to administer a beating simultaneously to a whole row of culprits, tied to the steam-powered apparatus, side by side, their bottoms exposed!¹⁵ (figure 1.1).

As a controversial social issue, the bonding of the worker to the machine also received scientific attention, leading to theories such as the “Science of Work” and “Taylorism.”¹⁶ These theories tried to give the issues raised by the widespread use of machines in working life a scientific basis. They concentrated on the worker, whose body and its motions were submitted to an intensive analysis. A central aim was to define the optimal body language that would enable the worker to perform with maximum efficiency. Chronophotographic studies, such as those by Étienne-Jules Marey and Georges Demeny, served a similar function: by freezing the movements of the body, captured in a series of successive photographs, gestures and motions could be submitted to an “objective” scientific analysis.¹⁷ There were deep contradictions underlying these theories. The supporters of the scientific approach claimed that educating the worker to use his or her body “scientifically” according to the defined principles, prevented it from becoming exhausted, making the worker’s life easier. The critics of mechanization countered by claiming that the proposed methods merely dehumanized the worker, turning him or her into a machine (or a machine part). As Mark Seltzer has shown, the need to adapt to the monotonous rhythms of the machine often led to psychological disorders known as “pathological fatigue” or “the maladies of energy” (Seltzer, 1992, p. 13).

From Automata to Automatic Machines

In the second half of the nineteenth century, a line of different machines appeared. In many ways they were the antithesis of the production machines in the factories and offices. The new machines were used voluntarily, outside the working hours. They were placed in all imaginable public places: street corners, bars, newsstands, department stores, hotel lobbies, waiting rooms at railway stations, amusement parks, seaside resorts, and trade fairs. Eventually they found their way into penny arcades designed for the purpose. Particularly from the 1880s on, many different types of machines were developed: vending machines, “trade stimulators,” gambling machines, strength testers, fortune-telling



| Figure 1.1 |

The automated spanking machine—humans chained to the machine for discipline. A nineteenth-century Victorian fantasy (source unknown), Erkki Huhtamo's archive.

machines, electric shock machines, games machines, automated miniature theatres (or “working models”), viewing and listening machines, automatic scales.¹⁸ These devices have come to be known by the generic terms “slot machines,” “coin machines” or “coin-operated machines” (coin-ops), referring to their basic principle of operation. Whatever the mode of interaction, the user begins the session by inserting a coin in a slot. The machine gives something in return: a postcard, candy or cigar, a “therapeutic” electric shock, a receipt with one’s weight or fortune, a visual or musical performance, an amusing joke, a psychologically or socially encouraging experience, an opportunity to train one’s skills, enjoy a sharp-shooting session or—last but not least—a possibility to turn one’s initial investment into a shower of coins.

In spite of their variety, on the basis of their mode of feedback, the slot machines fall broadly into two categories that could be labelled “automatic” and “proto-interactive.” These labels are necessarily anachronistic. In the late nineteenth and early twentieth centuries, the word “automatic” was often applied to any kind of coin-operated machine. The word obviously emphasized the fashionable novelty of these devices, associating them with technological progress and the march of the machines in society. Evoking the ancient tradition of automata (to be discussed later), it also referred to a situation where a human operator had been replaced by a mechanized system; whatever the mode, the com-

munication took place between a human user and a machine as the partner. An arcade advertising “Automatic Amusements” could contain an eclectic array of machines with many different user interfaces and modes of operation, all activated by the visitor him or herself (Pearson, 1992, p. 4). For an archaeology of gaming, however, the division “automatic”- “proto-interactive” makes sense. It helps us decipher the operational and cultural logic of these machines, and gives us clues about the cultural *modus operandi* of their electronic and digital successors.

According to our classification, in the case of an “automatic machine,” the user’s role is limited to a momentary, simple, noncontinuous action: inserting a coin, perhaps pushing a button or pulling a lever, and then maybe opening a box or lifting a cover. Examples of such machines are vending machines, mechanical miniature theatres, fortune-telling machines, music boxes, and “automated phonographs,” the predecessors of jukeboxes. After initiating the action, the user picks up a product or merely experiences the machine in operation. The duration of the experience varies. Picking up a cigar or a chocolate egg from a “coin fed” vending machine only takes an instant, whereas viewing or listening machines provide the user a somewhat longer scopical or auditive experience. It is important to note that after the initial action, the latter part of the experience is passive. The person enjoying the spectacle does not affect its nature in any way. The presentation has a

predefined course of action and duration. When it is over, the user can repeat it by inserting another coin, or just walk away.

The automated experiences provided by such devices were preceded by those offered by automata, human- or animal-like mechanical marvels that spoke, made music, or performed acrobatic stunts. Displayed by touring showmen and dime museums, such devices had astonished audiences for centuries. In addition to the technological simulation of life, their fascination must have been based on the distanced position assigned to the viewer. Direct interaction with the automaton was not allowed. The experience was mediated by a human, a showman who introduced, started, and interpreted the automaton's performance (and also collected the coins, sometimes aided by his monkey). In a way, the performing automaton created around itself a kind of "magic circle" the spectator was not allowed to enter. The classic automaton was also emphatically "useless." It was the opposite of a practical or productive machine, although its mechanism could be highly sophisticated (clockworks, etc.). An automaton performed its stunt to amaze, to raise money for its exhibitor, and perhaps advertise the skills of its maker (who often created "useful" things as well, such as clocks, and even mechanical looms). In their spectacular uselessness, the automata clearly differed from their successors, the prosaic, but highly performative industrial robots.

The way in which the emerging department stores appropriated the automata tradition in the late nineteenth century and metamorphosed it into their animated dioramas for the Christmastime window displays was a sign of the times. The animated diorama was now merely a teaser for the real consumeristic spectacle waiting behind it, inside the building. The window pane separated the spectators from the spectacle. The people standing on the sidewalk in front of the display had no direct control over it. They were supposed to be marvelling on the giant steps taken by commercial capitalism. The proliferation of automated slot machines in the cityscape took place simultaneously with this development. Here a user was given at least an illusion of agency, although within strictly predefined limits (which did not prevent people from treating the machines in subversive ways).¹⁹ The user was at least seemingly allowed to enter the magic circle, negotiating the experience oneself by touching the machine physically, and, most importantly, by "penetrating" it by means of the coin. What was the psychological consequence of this action? Did it break the magic circle,

or actually enhance it by making the user a participant in its mysteries? It might be proposed that the introduction of coin-ops was merely an alternative strategy adopted by commercial capitalism. Instead of marvelling at an "untouchable" spectacle in the department store window, the proliferation of coin-operated automatons gave the hard-pressed consumers a temporary, and largely illusionary, feeling of being in command.²⁰

Some automatic coin-op devices made efforts to re-create the magic circle of the display of automata by relocating it inside the device, often behind a display window. This is most evident in the case of the fortune-telling machines that contained life-sized animated figures enclosed in a glass case—these simulated fortune-tellers, "Princess Doraldinas" or "Zoltans," were essentially automata displayed in a new context.²¹ Although coin-operated, their fascination was based on their "mysterious" agency and "independence." The case of the Automatic Phonograph is more complex. The phonograph, the first successful device for both recording and playing back speech and music, was invented by Thomas Edison in 1877, and put into the market in an improved version a decade later.²² It became a great success as a stand-alone coin-operated version, often exhibited in public "Phonograph Parlors" (a predecessor of the game arcade). It was enclosed in a wooden cabinet with the phonograph mechanism—an attraction in its own right—visible behind a glass cover. The recording function was omitted. After inserting a coin, the listeners were connected with the device for a short time, wearing earphones and often leaning against the cabinet. Although this kind of contact may now seem insignificant, it anticipated later ways of spending time linked physically to a machine for the purpose of pleasure. With sounds from the earphones filling his/her head, the listener had entered a new virtual realm, another kind of magic circle. The experience could be lengthened by moving from machine to machine, with enough coins in one's pocket.

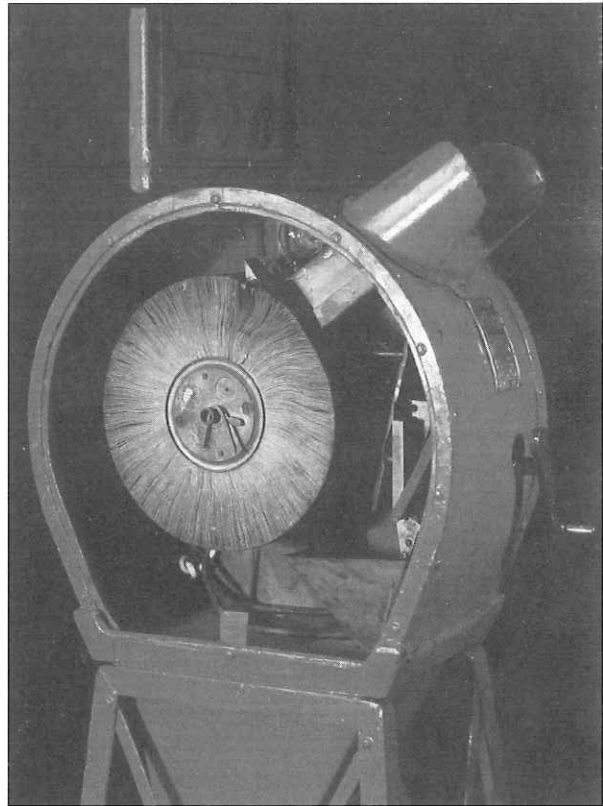
Proto-Interactive Machines

In the case of the proto-interactive machines, the human-machine relationship went further. Their operating principles were based on the user's repeated and continuous action to which the machine responded in various ways. The tactility of the relationship was essential: to activate the machine, one had to touch it by means of an interface. The gambling machines (later known as "one-armed bandits") were the simplest. Their operation was limited to inserting a coin and

pulling a lever that made a set of reels (usually three) with graphic symbols spin inside the machine. The outcome of the game depended on the final combination of the symbols.²³ The operation was made very user-friendly to encourage repeated use. Gambling machines were meant to have a mesmerizing effect on the user, creating yet another kind of magic circle, an intensive feedback loop connecting the player and the device. Mechanical repetition was to induce psychological repetition, which at times manifested itself as compulsive behaviour. The goal was to make the user spend more and more coins at an increasing pace. The effectiveness of this formula is proven by the fact that it still is the basis of millions of slot machines in casinos around the world.

Gambling machines gave minimal opportunities for higher level interaction—the outcome of the game depended on chance, rather than on the quality of the player's actions. Using such machines was not far from the repetitive gestures the worker was forced to perform in a mechanized factory. One might question whether such machines deserve to be called proto-interactive at all; the user was, after all, merely the initiator of the process (and perhaps, in the end, the recipient of a reward). The interactive quality of stereoscopic viewing machines, such as the popular Whiting's Sculptoscope, did not get much further. After inserting a coin, the user peeped into an eyepiece and released a series of 3D cards one by one by pushing a button or pulling a lever. It was only possible to effect the duration of the viewing act, to choose for how long one wanted to stare at an individual card before introducing another. Another device, the Mutoscope, provided slightly more opportunities (figure 1.2). First introduced in 1897, it was a novelty peep show box for viewing "animated photographs."²⁴ Different from its motor-driven predecessor, Edison's Kinetoscope, the Mutoscope was hand-cranked.²⁵ The frames of the moving pictures had been copies on paper slips attached to a rotating cylinder. Viewers could freely adjust the cranking speed, and interrupt the session at any point to observe a particularly interesting frame (perhaps a half-naked lady). The only limitation was that the movement could not be reversed. Of course, this was an economic rather than a technical imperative. For just one coin, the user could not be allowed to spend too much time with the device; the profit had to be maximized.

An advertising booklet from 1897 clearly expressed the proto-interactive nature of the Mutoscope:



| Figure 1.2 |

Mutoscope, International Mutoscope Reel Co., 1920s. Erkki Huhtamo Collection, Society of Film History, Helsinki, Finland. Photo: Kai Vase/SEA

In the operation of the Mutoscope, the spectator has the performance entirely under his own control by the turning of the crank. He may make the operation as quick or as slow as fancy dictates . . . and if he so elects, the entertainment can be stopped by him at any point in the series and each separate picture inspected at leisure; thus every step, motion, act or expression can be analyzed, presenting effects at once instructive, interesting, attractive, amusing and startling. (Nasaw, 1999, p. 133)

The expression "entirely under control" almost sounds like a flash-forward, an echo of the advertising slogans around interactive media. There was, however, an important difference: experiencing the voyeuristic offerings of the Mutoscope required no acquired mastery, a central quality of video games.²⁶ To view a Mutoscope reel one needed no more skill than for performing the simplified operations by the assembly line in a mechanized factory. Using a telephone switchboard or a typewriter was much more difficult. Strength testers and mechanical game machines took a step, although timid, toward incorporating mastery. Machines

belonging to the first type only required physical strength to punch a boxing bag, to hold handles as an electric stream ran through your body, or to have an arm-wrestling match with Apollo or Uncle Sam. The anthropomorphic interfaces may in retrospect have been their most remarkable feature. Most of these machines involved the use of hands, thus anticipating their growing importance on the field of interactive entertainments. The machine's interface often had painted or imprinted outlines of the hand(s), making the tactile connection visually explicit. Yet, anticipating the popular arcade game *Dance Dance Revolution* (Konami), there were also machines operated by one's feet. To excel in a more unexpected variant, the "Lion Head Lung Tester" (Mills, 1904), one needed to blow hard in a pneumatic tube to make a mechanical lion roar and flicker its eyes. Arcade video game makers have not explored this alternative, and probably never will.²⁷

With mechanical sporting games, displays of skill began to replace the need for raw physical power. From the late nineteenth century on, many different types came to the market, pointing toward the immaterialization of the gaming experience. Among the most successful genres were the shooting games (hunting, target shooting). They were sometimes justified by patriotic slogans, such as Lord Salisbury's dictum "Every man should learn to shoot!" (Costa, 1988, p. 21). Coin-operated shooting games were an individualized and mechanized form of the shooting galleries, which were popular attractions at fairgrounds and fairs. For any moralist deploring the devastating effect of *Doom* or *Quake* on today's youth, this background should give something to think about. There were many machines that simulated sports, such as boxing, bowling, football, and horse racing. The player either participated in the sport simulation as him/herself or transferred his/her actions to miniature players (kind of proto-avatars) operating within the realm of the game. By being mutated to this new mechanical arena the actual sport genres were transformed. Many early games were for a single player, but multiplayer possibilities increased steadily. Although the interactive possibilities offered by these machines were limited, the ways they managed to create desire, pleasure, and involvement anticipated the intense user-relationships created by arcade video games. In this sense none was more successful than pinball, a mechanized version of the Victorian parlor game *bagatelle*.²⁸ Introduced in the 1930s, its golden age dawned after World War II,

helped both by new, more interactive features (the flippers) and the emergence of the postwar youth culture.

The Social Contexts of the "Counter-Machine"

David Nasaw has characterized the meaning of early slot machines by saying: "Here was the perfect diversion for city folk, a momentary break from routine that was so unobtrusive it could be seamlessly interwoven into the fabric of daily life" (Nasaw, 1999, p. 159). The same people who spent their days chained to the machines in factories and offices could gather around these different machines during their lunch breaks or in the evenings and during the weekends. They provided an escape that did not take the users too far from their duties in daily life. The experience provided by these machines was short, fleeting, ephemeral. Their colorful appearance, their fantastic forms, and the very fact that they were a new brand of the Machine, the guiding idea of the era, increased their appeal. The sociologist Yves Hersant has analyzed the nature of these new machines by contrasting them with the world of work:

They are all based on the negation of work, and it is particularly ironic that in its social context the slot-machine has reversed its capitalistic and industrial role, thereby consuming rather than producing wealth. It is clear that such a paradoxical instrument could be found only in a mechanically-orientated world, both as a by-product and a counter product of mechanics. (Hersant, 1988, p. 9)

Slot machines obviously fulfilled a therapeutic function by providing the user an opportunity to step outside the capitalistic idea of constant productivity and scientifically regulated work routines for a moment. The user could release one's tensions by beating a mechanical strongman in arm wrestling, shooting herds of mechanical animals, or merely immersing oneself into the erotic fantasies of the Mutoscope. He (and more rarely she) could look for social esteem denied in the rigid hierarchy of the workplace. For the growing crowd of office workers, machines such as strength testers could actually perform a paradoxical return to the world of physical toiling of which they had been increasingly alienated in the modern office. Yet in spite of their therapeutic value, it would be naive to assume that slot machines had been able to achieve a true liberation, even a momentary one. It is more likely that the "negation of work" that began when a user put his/her coin

into one of these machines initiated a psychotechnical feedback loop that linked the working life and the spare time even more tightly together. The slot machines may have been “counter machines,” but they were machines nevertheless, and functioned according to machine logic.

Analyzing discourses of bodies and machines in the late nineteenth and early twentieth century literature, Mark Seltzer has paid attention to a peculiar psychic disorder that manifested itself as machine induced neurasthenia. As defined by Anson Rabinbach, neurasthenia means “an ethic of resistance to work or activity in all its forms.” (Rabinbach, 1992, p. 167). Much researched in the late nineteenth and twentieth century, it was identified as symptom of the fatigue caused by monotonous and repetitive work routines in mechanized factories. It would be tempting to associate the great success of proto-interactive coin operated machines with this same phenomenon. The overstimulated mind of a neurasthenic is unable to relax, except by being drawn to another kind of a machine. With machines and counter-machines filling one’s life, there is no way to break out of the circle. Whether such a comparison makes sense or not, it is tempting to look for a modern example of a similar phenomenon from Japan, where millions of “salarymen” (white-collar workers) spend their evenings, and often even their lunch hours, in one the countless game centers, driving simulated cars or trains, or staring at the screen of a Pachinko machine, with its endlessly bouncing balls. In a collective society with strict work morale, interfacing with game machines has become simultaneously an obsession and an outlet.

Although they may not have been a remedy to the psycho-physiological problems caused by machine culture, the slot machines also had a social dimension. Just like the amusement parks that became popular in the late nineteenth century, slot machines provided opportunities for new forms of social interaction between the sexes. They were a common topic for discussion, and also an opportunity to make an impression on others, to try to improve one’s self-esteem.²⁹ The social values activated by the slot machines were, in spite of the modernity of the phenomenon, mostly conservative. Devices such as gambling machines and strength testers did little to challenge the prevailing gender divisions. They belonged to the male territory. Gambling machines, located in bars, were rarely even seen by “decent” women. When it comes to the strength testers, women were usually assigned a passive role as observ-

ers, while the men punched the bag or swung the hammer. The Mutoscope was another device associated with the male user, mainly because of the erotic and voyeuristic content of many reels. Yet masculinity may also have been inscribed into the design of the machine. Linda Williams has noted the relationship between the physical turning of the crank of the Mutoscope (located on the frontside) and the action of male masturbation (Williams, 1995, p. 19). Partly because of its doubtful reputation, often commented on by satirical cartoonists, the Mutoscope has been left outside “serious” histories of the moving image, in spite of its phenomenal success and long-lasting cultural presence. If mentioned at all, it is presented as an early effort, a false path that was soon superceded by the mainstream of projected moving pictures. Until the end, Mutoscopes showed short clips, whereas the “real” film culture was associated with the feature film.

It could be claimed, however, that the world of slot machines may have been more heterogeneous than has been thought. Some studies about women’s spare-time activities around the turn of the century imply that the situation was not necessarily so clear-cut. Feminist scholars such as Kathy Peiss and Lauren Rabinowitz have challenged earlier ideas about women’s passive and distanced relationship to public amusements (Peiss, 1985; Rabinowitz, 1998). Particularly young working women (shop assistants, office ladies, factory workers) were looking for amusements from community halls, amusement parks, nickelodeons, or just city streets. They were searching for outlets from their somber living conditions and actively locating partners, thus subverting moral rules of the late Victorian era. The world of bars and saloons—the havens of gambling machines—were largely closed to women who were concerned about their reputation, but the sprawling urban environment must have offered women many opportunities to interact with coin-ops and other entertainment machines. One should not neglect the fact that women who had entered the working life as typists and telephone operators were often in more direct contact with the latest technology than males. Although, as Ellen Lupton has shown, they were relegated to the role of mediator and thus segregated from power and decision making, they would have been at ease with new machines, including coin-ops (Lupton, 1993).

Although there is at present little direct evidence about women’s contact with slot machines, after reading Peiss’s and Rabinowitz’s studies it makes sense to

assume that women used Mutoscopes and other coin-ops much more often than has been thought.³⁰ Some known photographs of women eagerly interacting with Mutoscopes point to this direction, although they fail to provide conclusive evidence.³¹ The fascination exerted by slot machines could perhaps be compared to the pleasures provided by amusement park rides.³² Yet the constitution of the subject position of these devices was quite different. Whereas slot machines required some form of conscious physical activity from the user, in the amusement park rides “[t]he person surrendered to the machine which, in turn, liberated the body in some fashion from its normal limitations of placement and movement in daily life” (Rabinowitz, 1998, p. 143). How did the forms of pleasure provided by these attractions differ from each other? Were the pleasures of proto-interactivity really very different from those provided by the “passive” sensations of the rollercoaster? These questions are important because they have been activated again in the context of interactive media, claimed to be categorically different from passive spectacles such as going to the movies or watching television.³³

A group that was largely excluded from using early coin-ops, with perhaps the exception of simple vending machines on the streets, were children. This exclusion was inscribed into the user interfaces of many machines. Many strength testers required too much physical power for children to use them. Kinetoscopes, Mutoscopes, and other peepshow machines had their viewing hoods or control interfaces so high from the ground that a child would not have been able to reach them.³⁴ It is likely that many children became acquainted with these machines with the help of their parents, lifting them up to the viewing hoods and control devices. Because of the bad reputation of amusement arcades, this experience often took place in family-oriented amusement parks and fairgrounds, where proto-interactive devices were placed alongside other kinds of attractions, including merry-go-rounds, rollercoasters, ferris wheels, and traditional shooting and gaming galleries. The presence of these different types of attractions created an integrated experience, where submission and immersion took turns with active participation. During the twentieth century, the number of coin-operated devices that were either meant for children or could be operated by them because of their interface design steadily increased (figure 1.3). This seems to have reflected social changes, such as the loosening of the family control on children’s pastime, the increasing amount of pocket money at their disposal,



| Figure 1.3 |

Children using a vending machine. Magic lantern slide, early twentieth century, Echer Slide Co., Dayton, Ohio. Erkki Huhtamo Collection, Los Angeles

and growing importance of human-machine interaction in daily life. More research on this topic is needed.

From the Penny Arcade to the Game Center

Early slot machines were placed in many kinds of public places, both indoors and outdoors. Like wall-mounted broadsides, billboards, and posters, they became one of the tokens of an urban landscape in transition. The novelty value of the coin-ops, which was reflected in many early cartoons poking fun at the devices as well as their users, gradually faded.³⁵ Although many machines were silently removed, others became a permanent feature of the modern city. They were so common and familiar that the city dwellers’ relationships to them became “automated.” To use one, one hardly needed to think about the entire operation. Although ever-present, the machines became invisible, like the ATMs today. This is probably also one reason for their nearly total absence from the cultural histories of the twentieth century.

Although the coin-ops were scattered in the cityscape, they were also concentrated in penny arcades. Beginning in the 1890s, such arcades were found in many cities, but also at amusement parks, midways (the entertainment areas of public expositions), and seaside resorts. Although some arcades were touring attractions, connected to a railway show or a touring circus,

many of them were located in storefronts, converted to accommodate the new “automatic amusements.” Many of these were modest, operating mainly during the winter season and housing the repertoires of touring showmen.³⁶ Yet there were also arcades that were permanently installed. They presented themselves as a new kind of entertainment that tried to attract a general “respectable” audience. David Nasaw has listed the offerings of an exceptionally luxurious early arcade, the Automatic One Cent Vaudeville emporium in New York City.³⁷ Most early penny arcades would have contained similar items, although in smaller quantities and in less grandiose settings:

Inside, the long narrow arcade extended a block south to the 13th Street. It was lit with chandeliers and hundreds of large white-frosted bulbs; the floor jammed with the latest and most luxurious collection of automatic coin-in-the-slot machines available anywhere. For the sporting crowd, there were punching bags to compare your punch with Corbett's, Jeffries', Fitzsimmons', or Terry McGovern's; shooting-gallery rifles; weights to pull; hammers to pound; stationary bicycles and bobby-horses. There were also automatic amusement machines that dispensed cards with your fortune, your horoscope, or your future wife's picture; metal embossers that spit out “Your name in Aluminum”; “automatic” gum, candy, and peanut machines; coin-in-the-slot phonographs with the Floradora Sextet, Sousa's Band, and comic monologues; and more than 100 peep-show machines. (Nasaw, 1999, p. 157)

On offer here was a true multimedia, multi-interface and multisensory experience, made even more attractive by the fact that the presence of media technology in the home was still very limited. Such arcades were, however, not an absolute novelty. The concept penny arcade evokes the popular nineteenth-century shopping arcades (or “passages”), considered by Walter Benjamin as one of the earliest signs of urban modernism (Benjamin, 1983). From the first half of the nineteenth century, such arcades had contained, in addition to shops and boutiques, also novelty amusements, such as dioramas and cosmoramas. For shoppers, such attractions were just another kind of commodity, an experience to buy.³⁸ Some shows even adapted the idea of the arcade to their own purposes. Cosmoramas, for example, were peepshow “arcades,” consisting of rows of magnifying lenses inserted into the walls. Viewers peeped at illuminated views, often with sensational subject matter, through the lenses. The popularity of cosmoramas—P.T. Barnum's mighty

American Museum had one—inspired all kinds of improved spectacles.³⁹ One of them was the Kaiser Panorama, a European-wide network of stereoscopic peepshow arcades that operated for several decades from the 1880s on.⁴⁰ Although the idea of gathering Edison's Automatic Phonographs and Kinetoscopes into public phonograph and kinetoscope parlors has often been treated as a cultural innovation, it was just an adaptation of an existing tradition.⁴¹ The novelty was in turning this tradition “automatic,” or, in other words, coin-operated. The cosmoramas and other early arcade amusements had usually been noninteractive. The images were for viewing only, and a fee paid at the entrance.

In spite of their huge and immediate popular appeal, penny arcades were often considered morally questionable, accused of being breeding-grounds for vice and even for infectious diseases. Penny arcades attracted a socially mixed crowd, including women. They were seen as dark and gloomy. The attitudes toward them had much in common with those associated with the earliest cinemas, known as “nickelodeons”.⁴² Like the penny arcades, many nickelodeons also operated in converted store fronts. Sometimes both were combined, with cinemas opened in the back rooms of the penny arcades (the association between pennies and nickels is not a coincidence). To enter the room, the spectators would have to walk through the penny arcade itself, filled with proto-interactive machines, above all Mutoscopes. The arcade would function as a waiting room (a kind pre-show) for the cinema experience, thus reenacting an already old tradition.⁴³ From a theoretical point of view, a tension was created between these two modes of consuming moving images—the hand-cranked peepshows and the screen projection. These two forms soon went to different directions, although some slot machines remained in the lobbies of cinema theatres. The co-existence of game centers and cinema multiplexes in shopping malls has brought them together again.

Although it is commonly agreed that both early penny arcades and nickelodeons attracted a mixed audience, its exact constitution is still open to debate. Particularly enthusiastic users for the penny arcades were certainly adolescent boys (when they managed to sneak in). Popular illustrations, including cartoons and postcards, often show delighted youngsters peering into the Mutoscope.⁴⁴ According to a contemporary observer, a sign displayed in Samuel Swartz's arcade in Chicago, “For Men Only,” “attracts the small boy like a magnet” (Nasaw, 1999, p. 154). This was often

considered a social problem, for which solutions were sought. Tinkering with wireless transmitters and radio sets was promoted as a good domestic hobby for boys at least partly to keep them away from the streets. For women, penny arcades were also considered unsuitable, although signs saying "For Women Only" were sometimes displayed next to some attractions (no doubt to stir the curiosity of men as well). As Kathy Peiss and Lauren Rabinowitz have demonstrated, young working women often disregarded reproaches and entered "forbidden" places. Considering penny arcades as a zone for men only seems a false generalization that fails to account for the variety of their audiences and attractions.

With the advent of the movie palace era in the 1910s, the cinemas managed to whitewash their public image. In spite of the fashionable "high class" penny arcades, their general reputation got even worse in the eyes of moral reformers and authorities. During the Great Depression of the 1930s, often considered the golden age of the penny arcade in the United States, these places provided unemployed men affordable opportunities to spend time. Interacting with an arcade game or trying one's luck with a gambling machine, often disguised as an "innocent" machine, such as a candy or cigarette dispenser, made one forget the harsh realities for a while. A common objection against slot machines was their association with gambling and organized crime. The authorities often adopted tough measures, forbidding slot machines and instituting laws against gambling. As Marshall Fey's history of the slot machine demonstrates, the trajectory of the fight against these machines is equally long as their history itself. Symbolic manifestations included the wrecking parties organized by the authorities as public stunts for the media.⁴⁵ Perhaps the most famous episode took place in 1934, when New York City's mayor Fiorello La Guardia himself posed for the press, holding a hammer with a large pile of wrecked machines.⁴⁶ Similar gestures had often been seen in propagandistic photographs from the Prohibition Era in the 1920s, only now slot machines had taken the place of the barrels and bottles of illegal alcohol. One might also recall the book burning rituals organized by the Nazis, another attempt to "purify" the society. When the Philippines' president Ferdinand Marcos forbid arcade video games in 1981 and publicly destroyed them with his hammer, he actually reenacted a well-established cultural model (Le Diberder & Le Diberder, 1998, p. 8).

The slot machine industry defended itself by changing its focus from games of chance to games of

skill. Instead of money, the successful player would be rewarded by immaterial values such as additional games or high scores displayed in the arcades. Pinball played a crucial role in this transformation. Although it was based on the nineteenth-century bagatelle and existed already in the 1930s, its heyday began in the late 1940s. In 1947, an engineer named Harry Mabs, working for Gottlieb, invented "flipper bumpers," little paddles used to sling the ball back to the gamefield (Kurtz, 1991, p. 56). Flippers were first used in a pinball machine named Humpty Dumpty, which became a model for countless later models. In this improved form, pinball became one of the symbols of postwar youth culture. Pinball machines appeared in bars or revamped game arcades, the inheritors of penny arcades. The typical players were now younger than earlier, males in their teens and twenties (sometimes in the company of their girlfriends, who were occasionally allowed to play).

Arcades, with pinball as their centerpiece, became part of a lifestyle that encouraged bonding among youth and served as a safety zone against the repressive values of both the family and the workplace. Playing became a way of being in two places at the same time (bilocation): entering into an intense relationship with an enclosed microworld and remaining at the same time part of a group of peers in the surrounding physical space. Pinball provided an opportunity to show one's mastery for oneself and others and to attain fame and acceptance within the gaming subculture. This situation was symbolically embodied in Tommy, the protagonist of The Who's rock opera (1968), later a successful musical. Tommy is a new kind of (anti)-hero, a neglected, mistreated and autistic youth, a "deaf, dumb, and blind kid," whose creativity and communicativeness are expressed through a single channel: his phenomenal ability to play pinball. "Standing like a statue," he becomes "part of the machine," according to the lyrics of "Pinball Wizard."⁴⁷ Similar figures have since appeared in the discourses around arcade video games, including films such as Nick Castle's *The Last Starfighter* (1984), a story about a small-town boy, whose one special skill, his mastery in arcade games, leads him to become an intergalactic warrior. The emergence of such *topoi* seems to indicate that continuities between predigital and digital gaming cultures may be more important than discontinuities.

Video game arcades were direct descendants of the game parlors. The transition that took place during the 1970s was gradual. Mechanical and digital game machines often existed side by side, as photographs

from the era demonstrate. There existed a continuity rather than a rupture between electromechanical slot machines and video game machines. Not only were the physical interfaces, such as joysticks, simulated guns, steering wheels, and so on, often used in earlier games; many game genres, such as driving simulators, shooting games, and sport and fighting games, already existed in predigital arcades. This connection has been symbolically expressed in a story about Steve “Slug” Russell, one of the creators of *Spacewar*. Russell is said to have exclaimed, many years after working on the game, as if struck by a sudden revelation: “*By gosh—it is a pinball machine!*”⁴⁸ As can be expected, video game arcades inherited their predecessors’ bad reputation. Parents’ groups and authorities concerned with the sanity and moral of the youth voiced loud criticism. The widely publicized prejudices against arcade video games and the arcades themselves were probably one of the reasons for the breakthrough of home gaming: parents bought video game consoles for their children to keep them away from those diabolic places. In the early 1980s, game centers launched campaigns to clean their image. Yet the efforts to turn the arcade experience into a form of family entertainment did not please the hardcore gamers who had grown up in the “seedy caves.” According to J. C. Herz, after the “destruction” of video game arcades, their real continuity can be found from the realms of networked role-playing games on the Internet, at least when it comes to the sense of community and atmosphere (Herz, 1997, pp. 58–59).

Conclusion: Beyond Cryptohistory

Slot machines have been almost totally neglected by cultural historians and media scholars.⁴⁹ Even historians of popular culture usually mention them only in passing, without analyzing them, or placing them into their original cultural contexts. The existing literature has been written almost exclusively by collectors and coin-op enthusiasts. The current state of things does not do justice to the long-lasting popularity and wide cultural impact of these machines. One reason for the *damnatio memoriae* is no doubt their near-ubiquity. When a phenomenon becomes too familiar and commonplace, it in a way turns invisible; we no longer pay attention to it. As counter-machines opposed to work, productivity, and progress, slot machines have been considered trivial, an ephemeral form of spending (or wasting) one’s time and money. The *damnatio* goes even further: not only have coin-ops been seen as trivial, they have been considered harmful as well, worth prosecution rather than praise. Of course, none of

this provides an excuse for neglecting them, for slot machines are, to borrow an expression from Siegfried Giedion, an essential part of the “anonymous history” of our time (Giedion, 1969). They have been a veritable laboratory for designing and testing forms of human-machine relationship. Perhaps it is only with the emergence of interactive media as a major cultural and economic force that their significance gradually becomes clear.

I have tried to show that excavating the past makes sense when trying to explain phenomena such as arcade video gaming with seemingly very short histories. Such an approach helps counter the claims frequently made by industry publicists and corporate “cryptohistorians,” who like to represent electronic gaming as something unprecedented, a unique phenomenon heralding an imminent transition into a culture of interactivity.⁵⁰ Of course, such claims are not totally unfounded. There is much unique, and perhaps even revolutionary, in the games themselves and in their nearly worldwide appeal. It also has to be admitted that we are probably witnessing only the first stages in a development that will attain much more massive dimensions and proceed into directions we cannot at present conceive. Gaming in public spaces such as game centers will be only one aspect of the game culture, alongside the use of domestic devices, mobile personal gaming platforms, and networking. This chapter has been deliberately limited to an “archaeology of arcade gaming,” trying to identify its outlines and the forms of human-machine relationships associated with slot machines. Without pretending that arcade video games and game arcades themselves could be entirely accounted for by reference to the past, it should be clear that many of their ingredients are found, albeit in rudimentary form, already in nineteenth-century developments.

The missing thread that should be woven into this narrative is, of course, the archaeology of games played at home and in various intermediate spaces with personal games machines. Isn’t *this* something unprecedented? Once again, there is a history of proto-interactive devices for domestic use, covering a great number of nineteenth-century “philosophical toys,” such as the phenakistiscope and the zoetrope, early media machines, including the phonograph, and an even greater variety of miniature theatres and other role playing environments. Nor should one neglect wireless transmitters/receivers and radio kits that have been widely available since the early twentieth century. These devices were not used for gaming, but they provided boys with an opportunity for personal tinkering

with technology (Douglas, 1992, pp. 44–59). Such activities anticipated coding and hacking—important aspects of the video and computer game culture from the outset. The history of commercial media also knows attempts to turn existing mass media channels into (pseudo)interactive experiences, including the 1950s children’s television program *Winky Dink and You*. As these examples show, electronic gaming cannot be traced back to any single source. It emerges from a slowly evolving, complex web of manifold cultural threads and nodes. What is clear is that this web began to develop a long time before anything like “digital interactive media” existed.

Notes

1. I use the concepts “electronic games” and “electronic gaming” in this chapter as conceptual umbrellas, covering phenomena variously referred to as “arcade games,” “video games,” “console games,” “TV games,” and “computer games.” There is much confusion in the use of terminology. By “arcade games,” I understand stand-alone games (enclosed in dedicated cabinets) played in public arcades or locations. By “video games,” I mean games played with a dedicated console connected with a CRT, most often a TV set. The concepts “console game” and “TV game” are more or less synonymous with a “video game.” The concept “TV game” (*terebi geimu*) is frequently used in Japan. A “computer game” is a game played with the personal computer, either off-line or online. There is much overlapping among these categories; numerous games are available for arcades, consoles, and PCs. An alternative to “electronic games” could be “digital games,” but the first mentioned seems culturally more established. The leading industry event in the field is known as Electronic Entertainment Expo (E3, Los Angeles), which is organized by the former Interactive Digital Software Association (IDSA), now known as the Entertainment Software Association (ESA). This seems to further emphasize the interchangeability of the words “electronic” and “digital” (although they by no means mean the same thing). The industry has more and more often shown signs of replacing the word “games” with “entertainment.”
2. *Breakout* was first released as an arcade game by Atari in 1976, and later as a console version. According to a well-known story, it is said to have been designed in four days and nights by Steve Wozniak at the request of his friend, Steve Jobs. Jobs had been given the task of designing a new game in the tradition of *Pong* by Atari’s founder Nolan Bushnell. The purpose of the game was to destroy a brick wall (on the top part of the screen) by slowly knocking out the bricks one by one by means of a paddle moving horizontally in the bottom of the screen. Jobs and Wozniak became founders of Apple Computer (see Van Burnham, 2001, p. 137). About the legends around the making of *Breakout*, see also Steven L. Kent, 2001, pp. 71–73.
3. Before *Pilgrim in the microworld*, Sudnow had already edited an academic anthology called *Studies in social interaction* (1972) and written the highly acclaimed *Ways of the hand: The organization of improvised conduct* (1978). In this book, anticipating *Pilgrim in the microworld*, Sudnow meticulously describes and conceptualises his process of learning to play the piano. In his motto, Sudnow quotes Martin Heidegger: “Every motion of the hand in every one of its works carries itself through the element of thinking, every bearing of the hand bears itself in that element.” (p. ix). *Ways of the hand* has been recently republished in a revised form (2001)—*Pilgrim in the microworld* deserves to be reprinted as well.
4. I would like to thank Grahame Weinbren for focusing my attention on Sudnow’s book.
5. As an exception to the rule, DeMaria and Wilson refer to a coin-operated version of *Spacewar* called *Galaxy War*, which appeared at Stanford University campus in the early 1970s. The authors think the game may have been available even before *Computer Space* and *Pong*, which would make it the first arcade video game. No conclusive evidence is given (DeMaria & Wilson, 2002, p. 13). Baer has recently written forewords to Van Burnham’s *Supercade* (2001) and to Wolf, 2001, which further consolidates his mythologized status as a founding father.
6. Stewart Brand (1974) gives a valuable rare, early account about the culture around *Spacewar*.
7. Herman, 6–7; Burnham, 28; DeMaria & Wilson, pp. 10–11. The game was displayed on a tiny oscilloscope screen and ran on an analog computer. Two special control boxes, predecessors of the joystick, were created. Kent dismisses the status of Higinbotham’s game because it

remained an isolated case and had no impact. It was not known by pioneers such as Steve Russell (*Spacewar*) or Ralph Baer (Magnavox Odyssey) (Kent, 2001, p. 18).

8. Kent's book is the most exhaustive chronicle to date, based on original interviews with over five hundred game designers, producers and executives. It is a massive and detailed, albeit somewhat naive "polylogue" that relies to a great extent on direct quotations. Another data collection, focusing on arcade machines and games, is Sellers, 2001. The "fan" in the title quite clearly also addresses the author, who begins his introduction: "I lost my video-game virginity at the age of six during an otherwise unmemorable afternoon at Cannonsburg Ski Area outside of Grand Rapids, Michigan. The game was *Breakout*, it was early 1977 and my mind was ready to explore the world beyond *Mister Mouth* and *Hungry Hungry Hippos*" (p. 10). The description has some affinities with discourses on religious conversion.
9. The European contributors (Le Diberder and Poole) are easily the culturally and theoretically most sophisticated ones. They also devote some space to the European game industry, which is almost totally missing from the American-Japanese perspective of the American writers.
10. As Mark J. P. Wolf has reminded, games are a difficult subject for study. Whereas it is easy to view a film or a television program, going through all the levels of a video game is a time consuming task, that requires practice and often special skills. See Wolf, 2001, p. 7. This may be one reason why so many early studies on electronic gaming kept a definitive distance to "hands-on" approaches, dealing with gaming as a general phenomenon; at most, the researchers had peeped at the games from behind the gamers' (often children's) shoulders.
11. Sudnow found this out when he realized that *Breakout*, the game he had been attempting to master (to play it through repeatedly, based on his acquired mastery) on a home console, was originally an arcade game. An important principle behind arcade games is their coin-op logic: while depending on the gamer's mastery, the game also has to contain some randomizing factors that will increase the likelihood that the gamer needs to insert a new coin from time to time. In a sense, Sudnow's quest for an absolute mastery of *Breakout* was misguided from the beginning, influenced by his background as a pianist. With piano, one can really learn to master a certain piece and repeat the performance over and over again.
12. For basic data, see Costa, 1988 (well written, but unfortunately not annotated), Bueschel, 1998; Bueschel and Gronowski, 1993; Fey, 1997.
13. See, however, Slovin, 2001, p. 139. Compare, Kent, 2001, pp. 2-3.
14. A classic account of this process is Giedion, 1969.
15. Cartoonists also imagined mechanical "photographer's chairs," that resembled ghastly torturing instruments. The idea of tying the person to be photographed to a mechanical contrivance had a basis in reality. Photographers often used head and neck stands to help people remain motionless when the picture was taken. The idea of freezing the subject was taken much further in prison photography. Inmates understood that having a photograph taken would help in their identification and surveillance. They tried to move their heads so that the photographs would be blurred. Special chairs with straps were created to immobilize the prisoner. This naturally also brings to mind the electric chair, invented in the 1880s for permanent immobilization of the inmates who had been given a death sentence.
16. See Rabinbach, 1992. About psychotechnical research applied to female office workers in Germany, see also Gold and Koch, 1993.
17. Marey's and Demeny's work also aimed at creating the perfect soldier: an effective and tireless killing machine. They received ample financing from the French army, who felt the need to improve its performance after being defeated in the Franco-Prussian war of 1870-1871. About Marey's work, see Braun, 1992.
18. A good way to gain an idea of the great variety of these machines is to peruse Bueschel, 1998. The book contains plenty of basic information and hundreds of color photographs. According to Nic Costa, the number of patent applications for coin-operated devices grew from three in 1883 to 139 in 1887, etc. By the mid 1890s, more than a thousand patent applications for such devices had been received by the British Patent Office (Costa, 1988, 11).

19. The history of subversive treatment of coin-op machines is as long as that of the machines themselves. Using fake coins is the most well-known trick, but there were many others, all the way to the well-known tilting of the pinball cabinet for enhanced performance. See Costa, 1988, p. 19.
20. The word "automaton" was used about coin-op machines. In 1895, *De Natuur* wrote: "At the present time we are being inundated with automatons. If this continues, the time will come when all the arts and crafts will be performed by machines which, at the cost of a coin, be it large or small, will be at everybody's service." (quoted in Costa, 1988, p. 16). Because of widespread mistreatment, most automatic machines only dispensed cheap items or gave small rewards.
21. Another inheritor of the automata tradition, also placed behind a sheet of glass are the animated dioramas shown by many department stores in their show windows around Christmas.
22. For a general history, see Charbon, 1977. On the background of the phonograph, see Gitelman, 1999.
23. The ultimate source of information on gambling machines is Fey, 1997. The author's grandfather was the famous slot machine manufacturer and inventor Charles Fey, the creator of the original Liberty Bell (1899), the model for countless slot machines up to the present.
24. On the invention of the Mutoscope, see Hendricks, 1964. For its early history, see Bueschel & Gronowski, 1993, pp. 91–100.
25. This decision may be partly explained as an effort to avoid patent infringement. The Kinetoscope and the Mutoscope were largely the work of one man, William Kennedy Laurie Dickson, who left Edison's company after the development of the Kinetoscope. Edison tried to find new applications for his electric technology, which may explain why the Kinetoscope used an electric motor to run the film. Mutoscope relied on a different principle, that of the flip book, which had been known since the 1860s. But Mutoscope was also more reliable and could be shown in places where electricity was not available. Kinetoscope soon disappeared from the market, whereas the Mutoscope became a great success that lasted until 1950s, and even later.
26. About the notion of mastery in video games and interactive media, see Weinbren, 2002.
27. Bueschel, 1998, p. 119. With twenty-first-century hygienic standards the popularity of pneumatic blowing machines in the late nineteenth and early twentieth century seems almost surreal.
28. About the history of pinball, see Colmer, 1976.
29. This strangely resembles the peculiar gym culture in today's Southern California. Gym card holders certainly exercise with all kinds of machines, but this act serves all kinds of symbolic goals, some of them conscious, some not. Gyms are places to display one's body, to socialize, and to create business relationships.
30. At the Musée Mécanique in San Francisco's Cliff House there is a slot machine that must have appealed to working women. It is the automated typewriter that functions as a fortune-telling machine. It is easy to imagine an office lady, chained to her typewriter all day long, pushing her coin into the slot of this machine. She does not have to do anything else—the typewriter types automatically for her.
31. A great example, captioned "'Living Pictures' on the pier, 1912" shows a row of four Mutoscopes outside on the pier, with two women peering into the machines. There are no men in the picture. Coe and Gates, 1977, 90.
32. King Vidor's classic silent film *The Crowd* (1929) provides a vivid picture of the willingness of the working women to immerse themselves into the new mechanized amusements.
33. About theme park rides, see Huhtamo, 1995, pp. 159–186.
34. The International Mutoscope Reel Company began at some point, probably in the 1920s or later, to manufacture special "kiddie stands" that would enable a child to use the machine. Such stands were special accessories. Still, their existence shows that the company began to acknowledge the importance of children as potential users.
35. In cartoons, the coin-ops seemed capable of performing any imaginable tasks. Graphic artists and humorists imagined "automatic dentists," "automatic conscience clearers," "automatic arbitration," "automatic warm water washstands," etc. They also showed people trying these machines, and being ridiculed by the crowd

- observing the operation. For examples, see Costa, 1988, pp. 14, 10.
36. Some penny arcades operated in the cities during the winter season, but were taken again on tour in the spring. They were hybrids of a stationary and nomadic attraction.
 37. The "Automatic One Cent Vaudeville" was the enterprise of Adolph Zukor (later CEO of Paramount Pictures) and Morris Kohn. See Nasaw, 1999, p. 157.
 38. The same arcades often contained showrooms for printers and toysellers, who specialized in optical toys, an important predecessor to moving images and also electronic games.
 39. The first Cosmorama is said to have been opened by the abbot Cazzara in Paris in 1808. See Campagnoni, 1995, p. 87.
 40. The Kaiser Panorama (later known also by other names) was the invention of the German August Fuhrmann (1844–1925). It was based on earlier stereoscopic viewing arcades. The prehistory of the gaming arcade is very rich and complex. It cannot be fully detailed here.
 41. The first phonograph parlor was opened by The Ohio Phonograph Company in Cleveland on September 15, 1890. The listening machines were often lined along the walls of the premise, reenacting the arrangement of the Cosmorama (also known as "Cosmorama Rooms"). Peeping at images was replaced by listening to sounds. The intimacy of the peephole was replaced by the aural intimacy provided by the earphones. See Musser and Nelson, 1991, pp. 38–39.
 42. For original documents related to this debate in the early twentieth century, see Harding and Popple, 1996, pp. 68–71. Several documents attack "mutoscopic" outrages, although defences are also included.
 43. This arrangement can already be found from Etienne-Gaspard Robertson's Fantasmagorie show in Paris in the 1790s. Fantasmagorie, or Phantasmagoria, was a form of magic lantern show. Before entering the hall itself, the audience often spent time in an antechamber looking at mechanical and optical curiosities and perhaps observing a popular scientific demonstration. This tradition continues in the pre-shows of many theme park rides today. For Robertson, see Levie, 1990.
 44. However, there is only one example of this in Bottomore, 1995, p. 171. There are several cartoons showing middle-aged men peering into the Mutoscope (see pages 40–43).
 45. A case in point, in France all slot machines (appareil à sous) were forbidden in 1937. According to Jean-Claude Baudot, they were still forbidden in the 1980s, although in less extreme form. There were ways to by-pass the laws. See Baudot, 1988, p. 19.
 46. See Fey, 1997, pp. 111, 137. Slot machines were forbidden in New York City from 1934 until May 1976. See Colmer, 1976, p. 37.
 47. "He stands like a statue / Becomes part of the machine / Feeling all the bumpers / Always playing clean / He plays by intuition / The digit counters fall / That deaf, dumb and blind kid / Sure plays a mean pinball" (words and music by Pete Townshend).
 48. Levy, 1984, p. 65. For Stewart Brand, Russell told that his main source of inspiration was the series of science fiction books called the Lensman by E. E. "Doc" Smith. See Brand, 1974, p. 55.
 49. Unfortunately, much of the evidence about the slot machine users' attitudes has disappeared without a trace, not being considered worth recording. We know the machines and the companies quite well, but not what people thought about them.
 50. About the notion of cryptohistory as applied to media production, see Schiffer, 1991, pp. 1–2.

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