The Medium of the VIDEO GAME

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This book is dedicated to all the video game designers, players, collectors, researchers, and curators whose interest in the video game has spurred the development of the medium.

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The Video Game as a Medium

Mark J. P. Wolf

It took a while for both film and television to attain the status of an artistic medium, and likewise the video game has been slow to gain recognition in academia as an artistic medium, even after almost thirty years as a commercial industry and forty years of its existence. After appearing as an experiment and novelty and then developing into a toy, the video game took only a little over decade or so to grow into an item of mass consumption. Early games were graphically simple, and the medium as a whole did not have a widespread impact on popular culture until the latter half of the 1970s. Also, the video game's status as "game" put it in a different category from traditional media, despite its audiovisual nature and often narrative basis. Whereas works in traditional media are made up of fixed, linear sequences of text, image, or sound (or combinations of them) which remain unchanged when examined multiple times (apart from effects of wear and tear), events experienced in a video game will vary widely from one playing to another. Film viewers can watch a film from beginning to end and be satisfied that they have seen the film in its entirety, but a video game player must often have some amount of skill to advance through higher levels of a game, and there are often courses of action and areas of the game which are still left unexplored even after several times through. Mastery of the video game, then, can be more involved (and involving) than mastery of a film; in addition to critical skills, the researcher must possess game-playing skills, or at least know someone who does.

Although one can refer to film viewing as "active," meaning that the viewer is attentive to what is being shown and is applying imagination and critical thinking to make sense of or "read" a film, video game play requires input—physical action of some kind—from the player in order to func-

tion, and often quick reactions within a very limited time frame. Only when a player becomes attuned to the way in which a game operates will success be possible; thus a certain manner of thinking and reacting is encouraged, sometimes at the reflex level. In a film, all the steering of on-screen events is done for us by the filmmaker, whereas a video game leaves more possibilities open. The manner in which and the degree to which a film or a video game is a vicarious experience differs greatly.

Like the cinema before it, the video game became enormously successful financially within its first decade. The uniqueness of the video game medium has also opened up a new realm of interactive entertainment which has yet to be thoroughly examined and analyzed the way cinema and television have been. At present, film and television theories examining the use of moving imagery and sound are fairly well suited for analyzing video games, although some additions are needed to address areas where video games differ from traditional media (for example, the interface, interactivity, navigation, and algorithmic structures). In order to see where video games fit into the spectrum of other media, it is necessary to first consider the boundaries defining the medium of the video game.

Defining the Video Game

Defining the limits of what is meant by "video game" is more complicated than it first appears. Rather than attempt to create a single, definitive statement declaring the essence of the video game, we can begin with a narrow, precise definition and gradually widen its scope out to a broader definition, passing through various definitions found in popular usage along the way. Different aspects, such as technology, art, and the nature of the experience need also be considered in defining the term. In its strictest sense, we might start by noting the two criteria present in the name of the medium; its status as "video" and as "game."

Elements one would expect to find in a "game" are *conflict* (against an opponent or circumstances), *rules* (determining what can and cannot be done and when), use of some *player ability* (such as skill, strategy, or luck), and some kind of *valued outcome* (such as winning vs. losing, or the attaining of the highest score or fastest time for the completing of a task). All these are usually present in video games in some manner, though to differing degrees. In video games, the scoring of points, adherence to the rules, and the display of the game's visuals are all monitored by a computer instead of by human beings. The computer can also control the opposing

characters within a game, becoming a participant as well as referee. One might also suggest that it is really the computer programmer, the person who wrote the program, that gamers are playing when they are "playing the computer," since the programmer's algorithms determine the actions of the computer-controlled players. In many cases, however, where brute computational force or speed is concerned, the idea that the computer programmer is the player seems a less tenable position (for example, supercomputer chess programs like IBM's *Deep Blue* and *Deep Thought* can certainly beat any of their programmers in chess).

Most video games are one-player games in which the player faces computer-controlled opponents and situations. Due to the almost instantaneous speed at which a computer can process user input, respond with reactions, and display the action on-screen, video games are often designed to require fast action and reflexes, much like sports or games like pinball or table tennis. Fast action is, for some, so integral to the gaming experience that narrower definitions of "video game" exclude text adventures, adaptations of card games and board games, contemplative puzzle-based programs like *Riven* (1997) and *Myst III: Exile* (2001), or any of the *Ultima* or *Zork* series, all of which generally do not require quick reflexes. Another element is the *identity* of the computer as a player. Keith Feinstein has suggested that the playing of a video game has a necessarily emotional element to it, similar to that of struggling against a playmate of comparable skill and ability. In his view, the computer must be more than a referee or stage manager controlling the video game's world; it must be an active opponent that competes with the human player. By assigning an identity to the computer player and creating a "one-on-one" situation within the game, competition becomes possible and emotional stakes are raised, just as they might be in a two-player game in which human beings compete against one another.

The programs mentioned above, however, are all marketed as games, and would be included in the broader definition of the term found in popular culture. Almost all programs designated as "games" by their makers contain the criteria mentioned above (conflict, rules, player ability, and valued outcomes), albeit to varying degrees. For example, in *SimCity* (1989) and the other "Sim" programs from Maxis Software, outcomes are ongoing as conditions of the simulated world improve or worsen depending on the player's decisions. Conflict occurs between the player (who is trying to provide order to the city) and circumstances or situations (such as natural disasters, taxpaying citizens, crime, pollution, and occasional wandering monsters). The "rules" are built into the game's responses; tax

the citizens too much and they will move away, cut funding to the police station and the crime rate will rise, and so on. In puzzle-based games like *Myst* or *Riven*, conflict may arise from the difficulty of puzzle solving, pitting the player's mind against the game designer's mind. Outcomes are also valued in these games; in each, several different endings or outcomes are possible, one of which is more desirable than the others.

A still broader definition of the term "video games" might include educational or utility cartridges made for dedicated game consoles. Some of these, like *Mario Teaches Typing*, incorporate gameplay into learning, although many do not. Still, educational cartridges (like Atari 2600 cartridges *Basic Programming* and *Fun with Numbers*) and utility cartridges (such as diagnostic and test cartridges) often appear in lists of game cartridges, are sought by collectors, and are included within popular usages of the term "video games" found in stores and many Internet discussion groups. Even though these programs are technically not games (according to the above criteria), the read-only memory (ROM) cartridges containing them are the same as those used for games; they are also given identification numbers, similar to the games; and they receive much the same treatment as game cartridges in the marketplace. Thus, the criteria used to group educational and some utility programs together with games reflect their status as commercial and cultural artifacts more than they reflect actual considerations of the program's content or the player's experience of that content.

While the degree to which a program can be considered a game depends on varying criteria, its status as "video" is only slightly less problematic. By the strictest definition, "video" refers to the use of an analog intensity/brightness signal displayed on a cathode-ray tube (CRT), the kind of picture tube used in a television set or computer monitor, to produce raster-based imagery. A slightly looser and more common definition of "video games," closer to the popular usage of the term, would also include games that do not have raster graphics, like vector graphic games, and games that do not use a CRT, such as Nintendo Game Boy games, which use a liquid-crystal display. By these definitions, most arcade video games and home video games using a television, as well as games played on a home computer, would qualify technically as video games. Video games using CRTs also vary in resolution, including standard resolution (640 pixels by 200 lines); medium resolution (640 pixels by 400 lines); and VGA resolution (640 pixels by 480 lines), which is similar to full-resolution television imagery.

Some video game purists, however, might argue that the playing of home computer games constitutes a different experience from arcade and home video game systems, despite the interactive image and CRT used in the home computer games. Since arcade video games and home video games contain computers within them, the argument concerns the idea of the "dedicated processor" or "dedicated system" whose main—and only—function is the playing of video games. Some dedicated systems, like the Nintendo 64 or PlayStation 2, are designed with the connectivity needed for graphically complex games, unlike their home computer counterparts. Yet even early dedicated systems like the Fairchild/Zircon Channel F and the Atari 2600 had educational cartridges teaching math and programming, so they were not used for games only, but had other possible functions.

"Computer games," then, are most usefully seen as a subset of video games, due to shared technologies such as the microprocessor and the cathode-ray tube. Furthermore, many games are now released across multiple platforms at once; for example, *Myst* was released for Macintosh computers, IBM-compatible computers, and Philips CD-I, as well as for dedicated game-console systems like the 3DO Interactive Multiplayer, Atari Jaguar, and the Sony PlayStation. As dedicated systems grow in power and home computers grow in speed and connectivity, the two technologies may converge until only functional differences remain, as well as the degree to which a particular system can be said to be "dedicated" to game playing.

For a game to be considered a video game, one would expect the action of the game to take place interactively on-screen. Thus certain games, like the *Clue VCR Game*, a version of the board game *Clue* which uses video clips on videotape, would not qualify since the video image is not interactive; nor does the action of the game—such as the moving of a player's pieces—occur on-screen. Some games walk the line between board game and video game, involving elements of both. Three games for the Philips Videopac video game system, *Conquest of the World* (1982), *Quest for the Rings* (1982), and *The Great Wall Street Fortune Hunt* (1982), all involved on-screen video gameplay as well as a game board with movers, combining video game and board game play. As the other cartridges available for the Videopac system were all on-screen games, the three video/board games are usually listed along with them, although they are really hybrid games. There are also games which used plastic overlays placed on the screen, such as the early games for the Magnavox Odyssey 100 system or the GCE/Milton Bradley Vectrex system. These overlays contained back-

ground images and provided color to black-and-white screen graphics, while the screen provided the moving elements of the player-characters. A number of early arcade games also added nonvideo elements to their game screens, such as *Warrior* (1979), which featured two vector-graphics knights in top view moving through scenery on the screen's overlay. As long as the action itself takes place on-screen, such games can be considered as "video" games.

An even broader popular definition of "video games" includes games and systems whose "video" displays do not use a cathode-ray tube and whose screens have less resolution than a television screen. Nintendo's Virtual Boy system, for example, uses twin monochrome screens (one for each eye), which are high resolution light-emitting diode (LED) displays of 384 by 224 pixels. Sega's Game Gear, a hand-held system, has a liquid-crystal display (LCD) screen of 160 by 144 pixels. Nintendo's Game Boy system uses a reflective LCD screen of 160 by 144 pixels, but with the Super Game Boy, a converter that plugs into the Super Nintendo Entertainment System (SNES), Game Boy games can be played on a television screen through the SNES. And with even lower resolution screens, there is the Atari Lynx, with an LCD screen of 160 by 102 pixels, and the Milton Bradley Microvision system, with an LCD screen of only 16 by 16 pixels.

As we move beyond games using CRTs and screen resolution decreases, the question arises as to how much resolution is needed to call a game a "video" game. The hand-held game systems mentioned above are included in many lists of video games because they are produced by the same companies (Atari, Nintendo, Sega, etc.) that produce video game systems that use television screens, and because they are all cartridge-based systems (as opposed to hand-held electronic games which are hardwired to play one game only).

One of the most important questions regarding the game's visual display is whether or not the game's screen is pixel-based and capable of imaging. Many hand-held electronic games use LED and LCD displays, but are not based on a grid of pixels. Games such as Parker Brothers' *Merlin* (1978) or *Mattel Electronics Basketball* (1978) have banks of lights which can be turned on or off, and while in some cases the lights may be said to represent "players" (as in *Mattel Electronics Basketball*), the lights are not used together as imaging elements. Similarly, in games with LCD displays, like Bandai's *Invaders of the Mummy's Tomb* (1982) and *Escape from the Devil's Doom* (1982) or Mega Corp's *Fireman Fireman* (1980) or *The Exterminator* (1980), the LCD elements or cells that are turned on and off are often

shaped like the game's characters in different poses and positions. These poses are laid out across the screen in such a way that they do not overlap, since the cells must be discrete to function independently. Thus the positions that characters can occupy are limited to a few nonoverlapping poses, which are turned on and off in sequence to suggest motion through a marquee-like effect. Whole images of characters are turned on or off, as opposed to pixels arranged in a grid which work together to create imagery.

The concept of a grid of pixels used for imaging, then, can be one criterion dividing the video game display from those used in other forms of electronic games. Pixels, as abstract picture elements (usually squares, rectangles, or dots), are all identical in shape and size and can be used in any part of an image. Only collectively do they produce a design which is recognizable as a character or object. (Pixels, of course, must also turn on and off and use the same marquee effect to suggest movement, but the Gestalt of movement they produce is a much more subtle one and improves with resolution.)

The screen which is a grid of pixels is a useful way to draw the line between the video game and many hand-held electronic games. Yet some hand-held games are occasionally included in a very broad definition of "video game" because they contain versions of arcade video games, for example Nintendo's LCD hand-held versions of *Donkey Kong Jr.* (1982), or Nelsonic's *Q*bert* wristwatch game of 1983. In both cases the game appears on a screen and play is analogous to the arcade game of which it is a version, even though it is highly simplified and the imaging technology is quite different.

The technology used in an electronic game or a video game often is a factor in determining what kind of form, content, and interaction the game can offer. In order to categorize video games and delineate the boundaries of the medium, then, it is useful to consider the different imaging technologies and modes of exhibition of the video game.

Imaging Technologies

Video games require displays whose images can be changed quickly. A variety of imaging technologies are used to produce video game imagery, resulting in different kinds of images. The vast majority of video games use either light-emitting diodes, liquid-crystal displays, vector graphics, raster graphics, or prerecorded video imagery on laserdisc, compact disc, or DVD-ROM.

As noted, certain game systems use light-emitting diode (LED) or liquid-crystal display (LCD) technologies to create their images. LED displays use diodes made with gallium arsenide phosphide, which produces light when a current is applied to the diode. LEDs can come in red, yellow, or green, although red LEDs are the most common. Although there are many hand-held electronic games that use LED displays, Nintendo's Virtual Boy is the only pixel-based imaging system to use an LED display.

The LCD contains a thin layer of long crystalline molecules that polarize light, sandwiched between grids of fine wires and polarizers. The polarizers are lined up in such a way that light passing through the crystals is polarized and reflected back to the viewer, resulting in a bright, clear square. When a current is applied to the grids, the molecules line up together in the same direction and have no polarizing effect, and light is absorbed, resulting in a darkened square. Early LCD screens were black and white, and can be found in many hand-held electronic games from the early 1980s, as well as game systems such as Milton Bradley's Microvision or Nintendo's Game Boy. Color LCD screens are now common, appearing in game systems like the Atari Lynx or Game Boy Color, as well as in most laptop computers.

Vector graphics and raster graphics both use a cathode-ray tube (CRT). The CRT, used in televisions and computer monitors, contains an electron gun at the narrow end of a funnel-shaped glass tube. The electron gun (a thermionic cathode) generates a very narrow, focused beam of electrons which is fired at the screen, located at the wide end of the tube. En route to the screen, the electron beam is deflected by electromagnetic means (such as coils or electrodes), which are controlled by an external signal. The deflected electron beam hits the inside of the screen, which is coated with phosphorescent (light-emitting) material. The electrons cause the material to fluoresce, or glow, producing the pixels of the image on the face of the screen.

Vector and raster graphics differ in the way they use the electron gun to produce the image on-screen. Vector graphics are made up of points and straight line segments, which are stored as coordinates in a set of display commands. The display commands are sent to a *vector generator*, which converts the commands into a signal that is sent to the monitor's beam-deflection circuits. Using this signal, the electron beam is deflected from one line segment endpoint to another, causing the beam to draw the vector lines onto the screen one by one. In vector graphics, all images are made up of line segments and points, and text characters are made up of collections of line segments. Because the path of the electron beam follows the command list instead of a preset scanning pattern, this process is also referred to as "random scan." Vector graphics were the earliest CRT-based computer graphics and were widespread by the late 1960s. Vector graphics appeared in a number of arcade video games in the late 1970s and early 1980s, and in one home game system, the GCE/Milton Bradley Vectrex, which appeared in 1982. The best-known arcade games using vector graphics include *Lunar Lander* (1979), *Asteroids* (1979), *Battlezone* (1980), *Tempest* (1981), *Star Wars* (1983), and *The Empire Strikes Back* (1985).

Raster graphics use the electron gun to draw an image onto the screen in much the same way that a television set does. The raster image is made up of a series of horizontal raster lines, each of which is a row of individual pixels. The raster image, then, is stored as a grid of pixels large enough to fill the screen. The electron gun is then deflected to draw the image onto the screen, one horizontal line after another, from top to bottom. Unlike the random scanning used for vector graphics, raster scanning uses the same electron beam deflection path for every image, allowing the preset path to be hardwired into the hardware. Filled shapes, text, and complex images are also easier to produce with raster scanning, and it is the method used in almost all computer graphics today.

Besides the use of graphics for text, there are different kinds of computer-generated raster graphics used in video games. They may be generated as two-dimensional, two-and-a-half-dimensional, or three-dimensional graphics. In games using two-dimensional graphics, all the characters, objects, and settings appear on a flat plane of space (as in most early Atari 2600 games). Moving objects are achieved through scaleable player-missile graphics, also known as "sprites," which are small pixel maps of a fixed size which can easily be redrawn at new coordinates. Examples of sprites are the individual space invaders in *Space Invaders* (1978), or the Pac-Man or ghost characters in *Pac-Man* (1980), or the bouncing balls or bullets used in shooting games.

Two-and-a-half-dimensional graphics involve overlapping planes of two-dimensional graphics, which is also referred to as "priority" (referring to the determination of which plane is drawn over the others). Through the use of multiple planes of imagery—one behind the other—which scroll through the screen at different rates, a sense of depth can be achieved. Objects can be made to appear to float over backgrounds and the effect of multiple layers can be achieved. Yet while the image is more than a single two-dimensional plane, it is not really three-dimensional either; thus the

"and-a-half" is added to denote something in between. Two-and-a-half-dimensional graphics appear in the arcade games *Moon Patrol* (1982) and *Zaxxon* (1982), and in home video games like *Super Mario Bros. 3* (1990) and *Warioland* (1995).

Three-dimensional graphics are those which have been encoded as three-dimensional objects in the computer's memory, for example, cubes, cylinders, spheres, pyramids, or other polyhedra. These objects can be turned and rotated and appear at different angles, unlike the flat grids of pixels in two-dimensional graphics. Three-dimensional graphics appear in the arcade games *I, Robot* (1983), *Virtua Racing* (1992), and many arcade video games produced in the 1990s, as well as many home video games for the Sony PlayStation, Sega Saturn, and Nintendo 64. Some games use pre-rendered graphics stored as images, such as *Myst* (1993), *Gadget* (1993), or *Riven* (1997), while others like *Doom* (1993), *Daytona USA* (1994), or *Tomb Raider II* (1997) generate both foreground and background imagery in real time, allowing perspectives and viewing angles to be changed by the player during the game.

Although the dimensionality of a game's graphics depends on the way in which the graphics are programmed, it is not always obvious from the visuals alone. Two-dimensional and two-and-a-half-dimensional graphics are sometimes designed to appear three-dimensional, and there are a number of ways of representing a three-dimensional space (see Chapter 3). A variety of graphic styles and strategies are used from game to game, many of which are designed to produce images with depth cues and a dimensionality which lies somewhere between two and three dimensions.

Another imaging technology used in video games involves the use of prerecorded video imagery stored on laserdisc, compact disc, or DVD-ROM. Some games, like *Dragon's Lair* (1983), *Space Ace* (1984), and *Time Traveler* (1991), play video clips of animation during which the player is to make a response. Depending on the player's response and timing, the game cuts to various other clips, representing success or failure. Other games, such as *Astron Belt* (1983) and *Firefox* (1984), overlay traditional computer-generated graphics of planes and spaceships over video clips of moving backgrounds, providing more interactivity. (There was even a home laserdisc game system, Rick Dyer's Halcyon system, but at a retail price of over $2,000 it did not do well commercially.) Today, games for home systems using video clips appear on CD-ROM, often in compressed formats with imagery of reduced quality compared with that found on laserdisc. Games like *Star Trek: Borg* (1996) and *Johnny Mnemonic* (1995) contain

branching, interactive narratives, whereas other games like *Myst* (1993), *Zork Nemesis* (1996), and *Riven* (1997) incorporate video imagery within computer-generated graphics.

While newer technologies like DVD-ROMs, networks, Internet video, and computer games actively reshape and extend the video game industry and the video game itself, the way in which a game is delivered to the public—its mode of exhibition—has always been an important consideration.

Modes of Exhibition

Over the years video games have appeared in a number of different venues, each with their own technologies, capabilities, market sector, and integration into the cultural production surrounding them. These different modes of exhibition include mainframe games, coin-operated arcade video games, home video game systems, hand-held portable games and game systems, and home computer games.

The games created on the giant mainframe computers of the 1960s were the earliest versions of video games, and were limited to the large, refrigerator-sized mainframe computers found only in laboratories and research centers. These games were experiments and were neither sold commercially nor generally available to the public. Some were quite simple, for example, games that played tic-tac-toe. The most famous mainframe game, however, and the earliest one by many accounts, is *Spacewar!* created in 1962 at the Hingham Institute in Cambridge, Massachusetts.[1] Written by Steve Russell, J. Martin Graetz, and others for the PDP-1 mainframe computer, *Spacewar!* consisted of two spaceships (the "needle" and "wedge") that could fly about the screen and fire missiles at each other. Other additions to the game included a starfield background, a star with gravity that pulled the spaceships into itself, and a "hyperspace" feature allowing ships to disappear and reappear elsewhere on the screen. The game was quite small by today's standards; 4 kilobytes, with 6 bits per byte and 3 bytes per word. *Spacewar!* was copied and adapted to other computers throughout the 1960s, and influenced other programmers. In 1971 it was adapted by Nolan Bushnell into the first arcade game, *Computer Space*, and later a version of it appeared among the first cartridges for the Atari 2600 home video game system.

Coin-operated arcade games are perhaps the best-known variety of video games, and were the first and foremost mode of exhibition which brought video games to the public. There are several different forms of

arcade games, each allowing for a different type of interaction: stand-alone consoles, cocktail consoles, sit-inside games, and virtual reality style games.

A stand-alone console, the most common kind, is a tall boxlike cabinet which houses the video screen and the control panel for the game. The game's controls might include joysticks, track-balls, paddles (round, rotating knobs), buttons, guns with triggers, and so forth. Occasionally there are controls for more than one player, although single-player games are the most common.

The "cocktail" console is designed like a small table, with the screen facing upward through a glass tabletop. Often the game is designed for two players, and there are sets of controls on both ends of the table, with the screen between them. This type of console is popular in bars or restaurants where patrons can sit and play a video game while setting their drinks on the tabletop (hence the name "cocktail"). Two-player games in cocktail consoles often are designed so that the screen can be viewed from either side, and usually contain games with an overhead view of a playing field (for example, a football game which is viewed from above) so that neither player has an upside-down view.

Sit-inside or ride-on consoles hold or contain the player's body during play and can even involve physical movement of the player's body, usually to simulate the driving or flying of a vehicle in the game, typically with a first-person perspective point of view. The games range from merely having a seat in front of the screen to enclosing the player in a box or even moving the seated player around during the game. In driving and racing games, foot pedals and stick shifts are sometimes included as well. Other types of interaction are possible; *Prop Cycle* (1993), for example, has the player pedaling a bicycle, while *Alpine Racer* (1995) has the player holding ski pole handles and standing on movable skis that lean from side to side during turns. In Sega's *Top Skater* (1997), the player rides on a skateboard, while in Namco's *Final Furlong* (1997) the player rides a "horse." These games tend to be more expensive than other types of games, sometimes requiring as many as four or five quarters per game.

Although virtual reality–style games are often hyped in movies, they have yet to become popular at the arcade; *Dactyl Nightmare* (1992) was the only one available throughout the 1990s, possibly because of its higher cost and need for an attendant. Each player stands inside a circular railing on a raised platform, wearing headsets with miniature screens for each eye, while holding a gunlike device with a trigger, an image of which also

appears on-screen. The game consists of two players wandering around an abstract setting composed of platforms, walls, and stairs, trying to find and shoot each other. Adding to the action is a green pterodactyl that occasionally picks up players and drops them. The players' views are sometimes shown on two monitors so that bystanders can watch the game from both points of view. The game's virtual reality interface is a novel feature, but the cost is high (usually about $4.00 for four minutes), and the setup requires an attendant to be on duty, which raises the cost of exhibition. Besides appearing in arcades, *Dactyl Nightmare* has also traveled as a fairground exhibit, its monitors often successfully drawing a crowd of bystanders.

Contemporaneous with arcade games, home video game systems appeared in 1972 with the release of the Magnavox Odyssey Model ITL-200 system designed by Ralph Baer. Home video game systems typically use a television for their graphic displays, although some systems, such as the GCE/Milton Bradley Vectrex or Nintendo Virtual Boy, are designed to sit on a tabletop and come complete with their own screens. Home game systems which display their graphics on a television can be console-, cartridge-, or laserdisc-based systems.

Console-based systems like *PONG*, Wonder Wizard, or Atari Tank have their games hardwired into them and are ready to go when the console is turned on. Many of the very early home video game systems were console based and had games such as tennis, hockey, and table tennis, most of which were variants of ball-and-paddle games. (Magnavox television model 4305 even had a built-in color *PONG*-like game with controllers that connected to the TV set.)

Cartridge-based game systems have their games hardwired into cartridges or cards which are plugged into the game console, allowing new games to be made for the console and sold separately. The first cartridge-based systems was the Fairchild/Zircon Channel F in 1976, although the 1972 Magnavox Odyssey ITL-200 system was plug-in card programmable and originated the idea of interchangeable games.[2] The Fairchild/Zircon Channel F came preprogrammed with *Hockey* and *Tennis*, in addition to having a cartridge slot for which twenty-six cartridges were made. The best-known early cartridge-based system is, of course, the Atari 2600, released in 1977. Cartridge-based systems could provide more games than purely console-based systems (some systems, like the Atari 2600 and the Nintendo SNES, have hundreds of cartridges available), and soon became the main kind of system produced.

Although most systems used the cards or cartridges with read-only

memory (ROM) hardwired into them, Rick Dyer's Halcyon system used laserdiscs, which could store video images. As noted, this system was too high priced for most consumers and did not last long on the market.

Hand-held portable games and game systems give players more flexibility than home video game systems since they run on batteries and can be carried along with the player. Hand-held games are usually small enough to fit in the palm of one's hand, and have small LED or LCD screens with buttons and controls beneath the screen or to the sides of the screen. Some of these games (although perhaps not always technically video games themselves) are simplified versions of video games from other systems, such as Nintendo's LCD hand-held *Donkey Kong Jr.* (1982), or games using the same characters, such as *Mario's Cement Factory* (1983). While most of these games are self-contained, there are hand-held cartridge-based systems as well, including Milton Bradley Microvision, Nintendo Game Boy, Game Boy Color, and Atari Lynx.

Although many arcade games and home video game systems have computers built into them, they are dedicated systems whose only purpose is to deliver video games. Beginning in the late 1970s and throughout the 1980s, home computers became available and their numbers grew quickly. Early video game systems helped to usher them in, as early home game systems like *PONG* and the Atari 2600 were often the first computer products to enter people's homes. And game playing has always been one of the more popular uses of home computers. Game software was available for practically every type of home computer, on floppy disk, tape drive, cartridge, diskette, or CD-ROM. Systems, like the Texas Instruments 99/4a computer, had a built-in slot for game cartridges, and other computers, like Coleco's ADAM and the Atari 400 and 800, were even made by game companies. While cartridges for the Atari 2600 contained 2 or 4 kilobytes and later 8 or 16 kilobytes of ROM, computer games stored on floppy disks could be several times larger in size. Storage media like magnetic disks could also be written on, allowing games in progress to be saved, which in turn meant that more complex games, taking more than an afternoon to play or solve, could be produced.

Today most computer games no longer fit on a single disk or diskette but have moved to CD-ROMs (compact disc, read-only memory). While a typical 5¼-inch floppy held around 164 kilobytes, and today's 3½-inch diskettes hold a little over a megabyte, a CD-ROM holds about 660 megabytes. The great increase in the amount of storage on a CD-ROM allows longer and more detailed games, as well as higher resolution graphics which add to verisimilitude. Many games, such as *Riven* (1997), *Star Trek: Borg* (1996), and *Phantasmagoria* (1995), take up multiple CD-ROMs. Newer technologies such as DVD-ROMs, which hold several gigabytes of data, can contain even larger games, and networked games played on-line can also be enormous.

In networked games, which are typically role-playing games (RPG), multiple participants are connected via modem to a video game world on a server, and can interact with the world and with each other's characters. These games can be run locally, over a LAN (Local Area Network), or on the Internet from anywhere in the world. Because many offices have computers networked together, gameplay has entered the workplace, with games like *Quake 3: Team Arena* (2000), *Unreal Tournament* (2000), and *Half-Life* being played during lunchtime and after hours (and, no doubt, in some cases during the workday as well). Networked games have grown in popularity, and in size, from games like *Sceptre* in the mid-1980s, which could have a maximum of sixteen players on-line at once, to 1997's *Ultima Online*, which has thousands of characters and requires multiple servers. Networked games have the potential for being the largest and most detailed video games (for example, *Ultima Online* is said to have "more than 189 million square feet of virtual surface"[3] in its world), as well as for having the largest numbers of players playing together. Many of these games run twenty-four hours a day, with players logging on and off whenever they want.

Although some people make a distinction between "video games" and "computer games," games are often "ported" (rewritten into different computer languages or systems) from one platform to another, broadening their markets and appearing in multiple modes of exhibition. Many dedicated game systems now have larger memories, faster speeds, and use CD-ROMs instead of cartridges. Computer emulation programs can simulate different game systems on a computer, with varying degrees of success. Even the notion of the "dedicated system" may soon be a thing of the past; Sony's PlayStation 2, for example, is designed primarily as a game system, but it also can play DVDs and audio CDs, go on the Internet, and download and store digital music and video from the World Wide Web.

The wide range of modes of exhibition has contributed to both the size and success of the video game industry. The forms these modes have taken, as well as the content of video games, are the result of the influences, precursors, and historical context in which the video game was born and raised.

Context, Influences, and Precursors

Like the invention of cinema, the invention of the video game was the product of many researchers, experimenters, inventors, and entrepreneurs, and its initial form was influenced by other media and technology already in existence. The various forces that converged to produce the video game tended to gravitate around the two poles of art and technology. The 1960s in general saw a convergence of art and technology, and the spirit of experimentation that existed provided a fertile ground for interest in and acceptance of new media.

Apart from the computer itself, much of the technology used by the video game was already firmly in place by the 1960s. Television was well established in the majority of American homes, and as the size of its cabinet shrank and its screen grew, it became more of an appliance and less of a piece of furniture (except for the sets with the largest screens, which were available in wooden floor-standing cabinets into the late 1970s). All that remained to be added was the microprocessor (in the video game console) to supply the television with image and sound, and it was a company that made televisions, Magnavox, that would purchase and market the first home video game system, the Magnavox Odyssey Model ITL200.

By the 1960s, computer graphics were already into their second decade of development. In 1949, the Whirlwind mainframe computer at the Massachusetts Institute of Technology became the first computer to use a CRT as a graphic display. The Whirlwind was shown to the general public on a 1951 episode of Edward R. Murrow's *See It Now*, and demonstrated a bouncing ball program and calculation of a rocket trajectory. Mainframes continued to be produced during the 1950s and became more accessible outside the military establishment. In 1962, around the same time *Spacewar!* was being written, Ivan Sutherland completed his Sketchpad system as a doctoral thesis at the Massachusetts Institute of Technology. The program allowed a user to create graphics on-screen interactively, using a light pen to draw directly on the CRT screen. By 1963, the trade periodical *Computers and Automation* was already sponsoring a competition for computer art, and the late 1960s saw a number of museum exhibitions displaying computer graphics.

Once interactive display graphics were wed to the cathode ray tube, the only remaining barriers to the commercial production of video games were public access and affordability. During the 1960s, minicomputers

were starting to replace mainframes in some areas, but they were still neither small enough nor cheap enough for efficient mass production. These problems were solved in 1971 with the microprocessor, invented by Marcian E. Hoff, an engineer at the Intel Corporation. The microprocessor is a central processor placed on a chip, and it allows computer components to be produced more cheaply and in greater quantity. The microprocessor made possible the development of the home video game and the personal computer, as well as cheaper and smaller electronic calculators. Using the new technology, Nolan Bushnell translated *Spacewar!* into a smaller unit containing the electronic circuitry necessary to deliver interactive graphics, which he set, along with a monitor and control panel, into a tall, floor-standing plastic cabinet. The game was renamed *Computer Space*, and appeared in 1971. The following year he used his profits to produce a second game *PONG*, which was more successful and widespread, and became many people's first experience of a video game.

One of Bushnell's most important contributions to the video game was the addition of a coin slot, making the video game a profitable venture and soon a commercial industry. The video game joined a long line of coin-operated machines reaching back into the 1880s, when saloon owners began installing coin-operated machines for bar patrons to compete on, or place bets on, as well as vending machines. Due to their success, there were soon a wide variety of coin-operated machines—strength testers, slot machines, card machines, racing games, and other "trade stimulators," as well as the coin-operated mutoscopes and kinetoscopes that paved the way for the cinema.[4]

Free-standing and countertop coin-operated machines could be found in saloons, parlors, and shop-lined arcades, and continued to flourish into the 1930s and early 1940s. The pinball machine developed out of these machines during the 1930s, and was produced by companies that produced other games, like the Bally Corporation or the Bingo Novelty Company. Through a series of innovations, the pinball machine gradually evolved into the form players are familiar with today. In 1933 electricity was added, and lights and backglasses were added in 1934. The pinball bumper was added in 1937, and the flipper in 1947.[5] After World War II, the pinball game saw its golden age, from 1948 to 1958.

Although pinball games flourished as a source of cheap entertainment during the Depression and war years, they were popular enough that their prices did increase. Originally pinball games cost a nickel per play, but later cost a quarter (today some even charge fifty cents or more). During the

early 1970s, the video game was able to achieve commercial success through its integration into the same market venues as the pinball game (at a similar price, a quarter a play). In the years that followed, video games quickly grew into an industry. Besides new companies like Nutting Associates, Kee Games, and Atari, companies producing pinball games such as Bally and Gottlieb also became producers of video games. For players in the arcade, the video game could be seen as one of the newest technological developments in arcade coin-operated gaming.

The early games' content was also influenced by technology. The explosion of technological developments in the United States following World War II, and particularly the space program, renewed the public's interest in science and science fiction. J. Martin Graetz acknowledges that science fiction novels by authors such as E. E. Smith and the science fiction films of Japan's Toho Films Studios (best known for Godzilla movies) were the main influences on the writing of *Spacewar!*[6] Throughout their entire history, video games have maintained a solid tradition of spaceships, shooting, and monsters, and science fiction themes have dominated the market. Computer graphics of the late 1960s and early 1970s, however, were not sophisticated enough to easily and cheaply produce detailed, representational moving imagery in real time, so simple iconography (dots, squares, rectangles) had to suffice. Detail and complexity were sacrificed for fast, immediate, and interactive action; a player could imagine the details, but action had to be depicted as a *visual* display.

Although their simplicity was due to technological limitations and not the result of deliberate artistic choices, the minimal, often abstract graphics of early video games fit in rather well with trends in the art world during the 1960s. During the 1950s, abstract art came to dominate the New York City art scene, and many strands of it developed into the 1960s. There were color-field painters like Barnett Newman and Mark Rothko, and the "hard-edge" painting style of painters like Ellsworth Kelly and Alexander Liberman, emphasizing simple forms and geometric simplicity. Influenced by these and other abstract movements, minimalist art developed in the mid-to-late 1960s. Artists such as Donald Judd, Sol Lewitt, Tony Smith, and others worked with squares, cubes, stripes, geometric shapes, and other minimal forms to create abstractions. Early video game graphics, with their points, lines, and blocks of color, often on a black background, coincided with minimalist, abstract styles of art. Likewise, electronic music developed during the 1960s and came to be known for its new computer-generated sounds and sometimes repetitious compositions. Electronic sounds

could be generated and repeated by a computer, and soon synthesized beeps and boops became the computer-generated soundtracks for video games.

The time-based and interactive nature of the video game also fit in with trends in 1960s art. The "happenings" of artists like John Cage and Allan Kaprow emphasized experience and process over product (sometimes including the audience's participation), and Sol Lewitt's famous essay of 1967, "Paragraphs on Conceptual Art," placed more importance on concept than on a tangible art object. There were also performances known as "light shows," like Jordan Belson's Vortex Concerts, or the light works of The Single Wing Turquoise Bird, a Los Angeles group that created abstract projections of light and color for rock concerts in the late 1960s. These shows were huge projections of shifting, moving light and color patterns which were designed primarily as experiences that could never be repeated exactly; chance often played a part in their making. Art installations using video cameras and monitors also appeared around this time. In 1970, Gene Youngblood's book *Expanded Cinema* explored the merger of art and technology of the time and included sections entitled "Television as a Creative Medium" and "Cybernetic Cinema and Computer Films," acknowledging the growing role of television and computer graphics in the visual arts.[7]

The video game, with its abstract, minimalist graphics, represented a new use for television and video; its experiential elements—the real-time interaction with an on-screen image—allowed players to feel as if they were communing with a machine that responded instantly to their actions. Besides coinciding with trends in art and a growing public interest in computer technology, the video game fit in popular culture as well, finding a place in the arcade next to pinball machines, and at home on the television. The video game, then, was perhaps the most commercially successful combination of art and technology to emerge in the early 1970s, and in many cases, the first computer technology widely available to the public and the first to enter their homes. As entertainment, it would soon come to compete with film and television, providing another source of diegetic or on-screen "worlds" of sight and sound—but one in which a player could directly interact.

During the first three decades of the video game's existence, the diegetic worlds of the games steadily improved and grew, and their form was heavily influenced by cinematic visual grammar. Throughout the 1970s and into the 1980s, computer processing power and memory grew, and the somewhat sparse look and feel of the early games gradually gave way to

more detailed and representational graphics. As the games' visuals developed, games began using different styles of lighting, different points of view, continuity editing, and other techniques from film and television. Games became more character centered. Visually, backgrounds had more scenery and became locations, and there was often more narrative context surrounding the action of the game. By the 1990s, video games had title screens, end credits, cutting between different sequences, multiple points of view, multiple locations, and increasingly detailed storylines. Many films and television shows were adapted into video games, and during the 1990s, a number of video games became theatrical motion pictures.

The video game medium has matured and continues to develop. While it may borrow or imitate forms from other media such as film and television, the video game as a medium includes new elements such as interactivity, collaboration and competition between players, and labyrinthine narrative structures, as well as new ways of structuring space, time, and narrative (see Chapters 3, 4, and 5). Video games have become a major force, commercially and culturally, and continue to carve out their niche among other media.

Notes

1. The information on the development of *Spacewar!* is taken from J. Martin Graetz, "The Origin of *Spacewar!*" *Creative Computing* (August 1981). Although its graphics were displayed on a CRT, *Spacewar!* did not video encode its imagery, so by narrower, more technical definitions, it would not be a "video" game. Also, see Ralph Baer's preface in this book concerning *Spacewar!* and the PDP-1 mainframe computer.

2. According to Ralph Baer,

> The first Odyssey (ITL-200) game was plug-in card programmable. The plug-in cards were printed circuit boards that interconnected the circuitry internal to the console in different ways to change the "game." These changes were showing or not showing a vertical bar at the left or at center, or making the bar half height (for volleyball) etc. The first appearance of a cartridge which contains a Read-Only-Memory chip . . . that was indeed introduced by the Fairchild machine which was among the first video game console to have a programmable micro-processor chip in it, something not even a gleam in anyone's eye in 1967–68 when we designed the original circuitry form our Brown Box (which became the Odyssey game).
>
> Therefore, the concept of changing games by plugging a specific cart (or Card) into a videogame console was definitely pioneered by the Magnavox Odyssey. It is hard to believe that the Odyssey choice of plugging in a card didn't ring bells with the Fairchild engineers who were designing their machine around a micro-processor and ROM, a combination well known by the mid-seventies.
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> From an e-mail from Ralph Baer, October 18, 2000.

3. Cindy Yars, "*Ultima Online*: Playing in the Garden of Eden," *Computer Games Strategy Plus* (July 1997), p. 45.

4. Richard M. Bueschel, *Guide to Vintage Trade Simulators and Countertop Games* (Atglen, Pa.: Schiffer, 1997).

5. Ken Durham, "History of Pinball Machines," GameRoom Antiques website, http://www.olg.com/gameroomantiques/historyPin.htm, as seen on February 13, 1998.

6. J. Martin Graetz, "The Origin of *Spacewar!*" *Creative Computing* (August 1981).

7. Gene Youngblood, *Expanded Cinema* (New York: E. P. Dutton, 1970).

tions. Perhaps the genius of these early video games—for the games, like computers, are not yet even toddlers—is that they give us a place to play out these neo-Luddite sentiments: slay the dragon, the ghost in the machine, the berserk robots. What we are fighting is the projection of our sense of inferiority before our own creation. I don't mean that the computer must always play us. Maybe, with just a few more quarters, we can turn the tables.

9

Archetypes on Acid

Video Games and Culture

Rebecca R. Tews

The room is dark save for the flickering images on the 35-inch TV screen. The figures on the screen weave and dart as they wage the battle between good and evil to the throbbing bass beat of the sound track. The room is consumed by the battle being fought. All eyes are on the epic struggle of the heroine as she tries to vanquish the evil warrior sent to destroy her. The player, a young woman of twenty, seated in this amphitheater, is joined in the battle by her mesmerized five-month-old infant. In the shadowy light, the baby girl's eyes glow with dual images of the battle her mother is fighting. Her tiny hands wave in the air as they try to mimic her mother's hand movements. This duo pauses only briefly to handle "baby business," barely interrupting the flow of the game. As the baby nurses at her mother's breast she continues to keep one eye on the images that pass before her on the screen, pausing only occasionally to eat with seriousness. She is oblivious to all else. They play in this quiet time before dawn because competition for the game is less during the hours when the husband/father is asleep. These vital hours of practice are required to be able to keep up with the "pro" when he is ready to play later in the day. They also unite mother and daughter in a unique bond of shared experience, emotion, and competition.

Understanding and explaining the impact of video game experiences is essential to understanding the cultural experience of this young family. The parents play for their own reasons and inevitably their young child will soon play as well. We know that early experiences strongly affect our sense of the world, our sense of self and ability to adapt to the environment. The role that video games play in affecting these senses is an issue that must be addressed in greater depth by the field of psychology because the games have as great a potential to impact behavior, problem solving, and social

coping as any other form of media. Unlike other approaches to understanding the video game phenomenon, psychology's response must be viewed in the context of the major philosophical approaches commonly used by the field to make sense of human behavior. The purpose of this discussion is threefold. First, an overview of the psychologically related research and application of the major approaches is provided as a foundation for understanding the immense impact these games may have on society as a whole. Second, out of this overview comes the suggestion that Jung's approach to understanding cultural archetypes may provide the best expression of the social impact of these games. Finally, Jungian theory is applied to specific games.

Modern psychology, as a scientific discipline, favors taking a step-by-step approach to defining and measuring less tangible aspects of human experience and behavior. Systematic research that addresses the cultural phenomenon of video games one step at a time is essential if we are to understand the processes at work. This modern scientific approach flies in the face of the old standard, the psychoanalytic legacy. Combining the philosophical insights of the psychoanalytic tradition with the more empirical research may be what is ultimately required to understand the complex role of video gaming and its impact on the psyche of individual and society.

The video game era certainly dawned with little fanfare in the academic and clinical world of psychological research. Frequently, video games were dismissed in the early literature as a fad and a passing fancy played by only a few advantaged children. Video gameplay was only addressed as school and behavior problems appeared, suggesting that some kids had significant difficulties related to gameplay. Under these circumstances it really is not very surprising that the handful of books and articles related to the behaviors and cultural impact of video games are sprinkled sparsely through the thirty years that encompass the video game era.

Brief History of Related Research and Assumptions on Video Gameplay

Early versus Later Demographic Research

Tom Panelas published the earliest systematic commentary on the world and culture of video gaming, arguing that these games would profoundly change the culture of youth. Additionally, Panelas noted that the video

game culture of the early 1980s was dominated by the battle between arcade and home play games for market share supremacy. The winner in this battle was predicted to strongly influence the role that video games would eventually play in youth culture because the home market would bring the games into the everyday experience of the entire household rather than staying a free-standing, youth-centered entertainment venue.[1]

Time has demonstrated that the home market has outstripped the arcade market.[2] While some might argue this point, it is important to consider the overall impact of the home market, including resale sales figures and total hours of use, when one is calculating the overall impact of each venue. Further, new generations of technology allow the home games to have graphics and thrills which rival those of arcade games. From an economic perspective, hours of home gameplay can be had for significantly less cost than an equal number of arcade play hours. Continuously improving home technologies such as large-screen TVs and super-surround sound speakers often result in a home gameplay experience that equals the arcade experience (and there is no line behind you). As video gameplay has moved increasingly to the privacy of the home, an accurate measurement of how long people play and how they respond is much harder to achieve.

The earliest research looks at gaming as almost entirely a youth phenomenon. Perhaps in the early 1980s this was true. Research suggests that children were much more receptive to the new technology than their adult counterparts and that they seemed to see more value in the play experience.[3]

While we believe that gaming peaks in adolescence, between age thirteen and seventeen, there is no evidence to suggest that it is outgrown or that people do not continue to play into adulthood.[4] In fact, it appears that adults who played as adolescents continue to be avid users. Although most general research looks only at childhood players, marketing research suggests that adults play as well. Time has shown that many of those who began playing in childhood continue to play as adults and to share the experience with their young children as soon as they are old enough to play. In fact, direct observation suggests that infants and very young children are mesmerized by the flashing images and sound effects commonly found in games available on the home game market and watch their parents' play with rapt attention on a daily basis.[5] In other words, for many younger families gaming is a form of interactive family entertainment and a cultural tradition shared between generations from infancy on.

The earlier systematic research on this phenomenon also looks pri-

marily at usage rates and the impact of arcade play on the grades and behavior of adolescent boys, reportedly because girls were not playing in the arcades.[6] It appears that girls have always played at home but preferred not to do so in the male-dominated arcade environments or for the purpose of competing with others. Instead they play as a social activity and when lonely.[7] Additionally, anecdotal research suggests that females believe video gameplay is a male-dominated activity and are reticent to admit the frequency of their game use.

Early versus Recent Research on Affective Impact

The majority of psychological research on the affective impact of video games, both early and recent, focuses on aggression. Generally, this research hypothesizes that video game violence and competition significantly affects player behavior. This is attributed to the level of interaction between player and game rather than passive observation. With some mixed results, these hypotheses have generally been supported.[8]

As video game realism has increased, so has the amount of affect generated in response to gameplay. Collateral to research on video games and aggression, anxiety and self-esteem have been examined in a less intensive manner.[9] The results of these studies have also supported the notion that realistic games produce more intense behavioral and emotional responses in the player.

Research on affective, behavioral, and physiological responses to the games suggest that people do play at different intensity levels. It is suggested that perhaps 11–25 percent of players feel a compulsion to play.[10] These players are more intense, more competitive, less able to cope with distractions, and more likely to fantasize about and role-play their favorite characters when not playing the game.[11] No research to date has addressed the impact of the compulsion to play on family dynamics. Clinical observation suggests that this is a problem that cuts across several generations.[12]

The problem with the early research is that it did little to encourage additional research on the complexities of the gaming world. For example, researchers often failed to distinguish between home and arcade play. The more recent research is characterized by a more focused emphasis on affective and physiological responses to gameplay. This research is a significant improvement in understanding the experience of gameplay and how it reinforces us; however, studies still often suffer greatly from methodological problems and small subject sets (fewer than fifty subjects) which limit generalizability and accuracy.

Overview of the Psychological Theories Related to Gameplay

Three main theoretical perspectives—behaviorism, social learning theory, and psychoanalysis—have dominated the field of psychology. A brief overview of each approach puts the related research in context and demonstrates why the research has been less than successful at explaining the video game experience.

Behaviorism and Video Games

The behavioral perspective suggested by B. F. Skinner[13] focuses primarily on human behavior as the result of complex interactions between the various punishments and rewards we receive from the environment. Through various studies on behavior (utilizing pigeons and a contraption now known as a Skinner box, which provided corn as an immediate reinforcement), Skinner demonstrated that most organisms will perform repetitive behaviors for very little randomly distributed reinforcement. Skinner's theories are used to explain why we gamble or play the lottery when we know we have little chance of winning and a large chance of losing. Behavioral psychologists are interested in video gameplay because the game unit is perceived as the ultimate Skinner box. The game environments reinforce the player for improving responses with additional points or movement on to higher levels (differential reinforcement of successive approximations, also known as "shaping"). In the case of violent, aggressive, or antisocial games, we are also reinforced for aggressive, quick-thinking, and bloodthirsty behavior.

But do we play solely to move on to higher levels, gain more points, or get to the end of the game? Is this simplified approach enough to account for this multi-billion-dollar mega-industry and the ever-increasing demand for new, interesting, and challenging games? It is doubtful that reinforcement alone accounts for intense interest and response to these games. It certainly cannot account for emotional responses to the games or the rapt attention of the small, non-playing observers.

Social Learning Theory: A Plausible Explanation of Gameplay Behavior?

Social learning theory, first articulated by Albert Bandura,[14] demonstrates that we learn from observing models and mimicking their behaviors. Chil-

dren in these studies were placed in a room with a "Bobo Doll"(a blow-up punching doll). What the children did with the doll depended on what they had seen prior to being placed in the room. Those that watched someone hit the doll and yell at it copied that behavior. Through research with the now-infamous "Bobo Doll," Bandura concluded that children learn from watching others. Live models are most effective, but children also learn from behavior observed in TV, cartoon and book characters of all types,[15] and from behaviors they are told about. In fact, we all do to some extent. Nearly all of the psychological research on video gameplay has been built on the foundation laid by Bandura's research on the contribution that TV and media make in our social development. In other words, Bandura's work on how we learn culture is a predominant influence in the psychologically related research on video game culture.

This approach does make significant contributions toward our understanding of play behavior and multigenerational interest. It explains why a small child would pay attention and mimic a parent's or older child's interest in the games and grow up to value playtime. It also raises issues about what the game characters are teaching as we interact with the fantasy world. Again, however, as with behaviorism, this approach provides an oversimplified answer for how we become emotionally involved in the gameplay experience and why it becomes such an influential part of our lives. It is unreasonable to believe that all affective game response and cultural influence is based solely on observation and expectation of reward.

Psychoanalysis and the Subconscious Connection

Psychoanalysis is one of the foundational schools of thought in psychological philosophy. Based on the work of Freud and Jung, this approach emphasizes the conflict between our pleasure-seeking subconscious and our more conservative conscious minds. Reassessment of the global cultural impact of the games through the use of Jung's unique psychoanalytic view may be more helpful in understanding the complex connections of these interactive media experiences to our sense of self.

Carl Jung argued that all societies share a primitive and basic understanding of the world.[16] These understandings, depicted through symbols or archetypes, most often appear in our art, dreams, analogies, metaphors, and nonverbal communications. They are the backbone of our primitive knowing, affective responses, fears, aspirations, and sense of progress through life's stages. These archetypes are translated into standard symbols

that tell the collective story of our human experience and our search for meaning.

There are those who argue that our legends, myths, fairy-tales, and even modern stories work because they touch that primitive archetypal self.[17] In effect we are drawn to these stories because they connect with our own experiences in the real world. Video games may have such a powerful influence because they connect on many levels with these same primitive symbols.

Jungian-Focused Theory of Game Culture

These archetypes may have some innate connections, but they are solidified in our subconscious sense of self in early childhood—through the stories we see and hear and through our early experiences. These archetypes, then, exist for us on two levels. On a subconscious level, accessed mostly through dreams and unspoken images, these symbols affect our interpretation of environmental stimuli. Later, with practice, we may become consciously aware of these symbols in our quest to bring meaning to our experiences and to share with others our sense of these experiences.[18] Often this occurs through storytelling. All cultures use the retelling of myths and fables in this way. They also use art, song, and dance in a similar way.[19] Video media and interactive video are recent newcomers to this traditional world of symbols, but they are no less significant in their content.

In modern society, we spend little time engaged in telling the stories of old. Gone are the fireside stories of the ancient heroes and their successes and mistakes. Gone are the symbolic trappings of their journey toward self-actualization; the weapon, the talisman, the quest. In their place we watch our new heroes on television and listen to them tell their own stories, *or* we become them, writing the script through our experiences in the video game world. The most popular games provide us with the opportunity to join the quest to conquer evil villains, protect the weak, or develop the skill to gain the highest honor or most points. This is true of all games, whether they are action, fantasy, sports, or skill games. We like them because they temporarily transport us to another reality.

The interactive medium of video games allows us to join the story in progress and become one with the quest. Stimulating our curiosity, desire to succeed, and desire for other reinforcements, these games transport us to an alternate reality where we can learn to succeed. Regardless of whether the game involves dueling adversaries, a quest for treasure, or simply per-

fection of a skill—the games themselves become symbolic of our own quest to self-actualize, our quest to become better than we currently are. With endless "do-overs" and plenty of chances to learn what comes next and what reinforcers we can expect, these games are the best Skinner box ever invented. However, these games also contain the basic symbols of the human experience. The most common of these archetypes are the villain, the threats to self from seemingly "safe" objects (like trees, rocks, or "safe" animals), the power for resurrection (through food, power pellets, rings, or other energy sources), the voluptuous and often dangerous *anima*, in Jung's terminology (the archetype of the female, who symbolizes both birth and death), and so on (as opposed to the *animus*, or male figure). These symbols exist in all cultures through history. All stories created by humans contain elements of these images. Western thought and Christianity have modified the way our society perceives these images, but they have not left us.[20] They are alive and well in the video game world. Here they appear as if on LSD—caricatures of the traditional images, highly transformed by technology, color, speed, and sound, but elementally the same.

From a psychological point of view what is most intriguing about the games isn't that people gravitate toward them, use them for long periods of time, have trouble ending their play before successful completion of a game, or become disinterested in the games as soon as they have conquered them. Rather, what is most fascinating is that the gameplay may modify the player's behavior in interpersonal relationships. Gameplay, particularly with violent or frustrating games, seems to elicit increased perception of threat, increased physiological arousal in game threat situations (which may translate to other perceived threat situations), and less use of traditional verbal problem-solving strategies and appropriately assertive person-to-person conflict resolution. Again, there may be an archetypal connection here. The human "nuisance" becomes one and the same with the game adversary on the subconscious level. The individual responds with the feelings and the problem-solving behaviors learned in gameplay. In effect, the video game world teaches responses to problems that may be effective in the surreal symbolic world of gameplay but may not be as effective in the highly structured, over-controlled modern society in which we now live.

Jungian Archetype Theory Applied to Gaming and Specific Games

The gaming world as a whole generates its own language and shared understanding of the symbolism behind the "effects" in a game. One need only

visit game players' websites or pick up the latest copy of their favorite gaming magazine to observe this phenomenon. The games also speak to the inner self in a way that releases inhibitions against basic affective responses. Observing game players behind a one-way mirror has suggested that they ride the roller-coaster of their successes and failures in quick succession—cursing at a failure, berating their poor choice of solutions, praising themselves for their successes, acting out frustration on the equipment when progress is slow.[21] Behavior of this type has been observed with all types of games from fantasy to action to skill. Interestingly enough, this affective response is what is needed to ensure the popularity of a game. Games that don't engage the user on an emotional level are considered "boring," "dumb" and "for babies."[22]

Almost intuitively, the game creators know what will strike that personal chord for their audience. The heroes and villains they create come from their own subconscious, which reflects the broader culture in which they were raised. Market research further fine-tunes the selection of these themes. Themes that strike a universal chord are more likely to succeed. Without the game player consciously realizing it, these archetypes are entering their lives.

A Few Specific Archetypes in Popular Games

With the exception of *PONG* (1972), all of the early games showed evidence of the archetypes to one degree or another. A classic example of this is *Pac-Man* (1980). The sun-shaped Pac-Man represents the animus or male presence on a quest to survive various trials. As this character progresses through the game, the shadow world threatens his existence as the ghosts try to take his lives. Pac-Man's defense against this threat is the nurturance of various foods left on the path and the occasional pellet, which transforms the ghosts and allows him to however briefly place them in bondage. The maze is an archetype of the quest to find meaning in life. The holding area for the ghosts typifies the symbolic notion of the netherworld. Granted, the technology of the period limits the detail and realism, but many action games from this point forward are essentially variations on this theme. Examples of these later games include all of the Sonic the Hedgehog games, the James Pond series, *Diddy Kong Racing* (1997), and *Bubble Bobble* (1986)—to name a few. They all include the conflict between the "good" characters seeking fulfillment from the environment and avoiding the marauding evil characters.

Centipede (1980) represents yet another set of symbolic themes. The

game pits a descending snake-like creature against the vigilant protagonist armed only with a finite supply of magic bullets. Snakes, dragons, and reptilian creatures have long represented humanity's struggle with the animal world. In mythology these animals also represent evil incarnate, a scourge from the bowels of the earth. The challenge here isn't to negotiate the journey but to defend the self from personal destruction. Again, the cutesy graphics and lack of realism obscure this theme. Nevertheless, it does exist and in later games becomes a much more embedded and fully developed theme. So many of the more recent games include themes of reptilian evil that it seems almost a requirement for an interesting game. Games including this typical theme include *Shadow Madness* (1999) and *Hercules: The Legendary Journeys* (1999), to name but a few. Interestingly, these characters are often mutations of their real-world counterparts, which suggests a transformational process. Henderson argues that this alchemy represents the evolution of the beast of the underworld as it transitions to supernatural status through its experiences in our reality.[23] This may reflect an innate belief in the presence of evil or negative energies that exist beyond our conscious knowing.

Action games of the early period are also replete with the archetypes of threat, conquest, and death. Even such favorites as *Frogger* (1981) and *Defender* (1980) contain themes emphasizing survival of the species against formidable odds. We need that sense of "us" against the unpredictable being from on high to maintain our sense of human identity.[24]

With the advent of games containing female (anima) figures, other common archetypes begin to emerge. These figures tend to fall into one of three categories. She may be the weak damsel in distress awaiting rescue (*Donkey Kong* [1981], *Night Trap* [1992], *Gex 3: Deep Pocket Gecko* [1999]), the villainess, seductive but deadly (*Mortal Kombat III* [1995]), or a more recent development, the powerful female warrior who can both defend herself and be sexually erotic at the same time (the *Tomb Raider* Series). This pattern is consistent with our understanding of the anima as having both positive and negative aspects. These characters represent the age-old conflict typically experienced by men trying to individuate from the nurturing protective mother and become connected on an adult level to a female sexual partner. At once protective and resentful of the female, men expressing this conflict often create the image of woman as a helpless creature in need of rescue who is ultimately under their control. If men fail to rescue her, she perishes without fulfilling her sexual potential, freeing them from the need to connect with the female aspect.[25]

Symbolic of the male need to believe himself powerful and independent, Jung argues that the weaker woman archetype is designed to protect man from his deepest fear.[26] Jung suggests that men throughout the centuries have had an intense fear of losing the self to the strong, controlling, procreative female presence. This deep fear is more honestly symbolized by the dark anima. Voluptuous and violent, she stands for creative power, sensuality, and control of man. Receiving gratification and nurturance from her means giving up freedom and male identity. This anima force stands as a direct opposite to the animus or male force and is perceived as the ultimate threat to male selfhood. She must be dominated either in combat or through other symbolically sexual means if the animus is to survive.[27]

The darker anima themes are more prevalent in recent games in the *Mortal Kombat* series, *Parasite Eve* (1998), *Bust-a-Groove* (1998), *Virtua Fighter 3: Team Battle* (1998), *Giants* (2000), *Shenmue* (1999), and *Apocalypse* (1998). While the games vary in content, they include the standard anima characters either as the main villain or as ancillary characters. Even games such as those in the *Tomb Raider* series that contain strong female characters (e.g., Lara Croft) as the main protagonists often cast those characters in a more negatively focused anima form.

Lara Croft, for example, is a highly idealized anima form. She is novel to the male player because of her highly sexualized body, and the angles from which it is viewed during gameplay obscure the more intensely threatening possibility that she might turn her weapons on any man that tries to sexually dominate her. Through Lara, voyeurism is elevated to a new level, allowing the male player to hide once again behind a protective woman as he formerly hid behind his mother. For female players, on the other hand, Lara represents a powerful warrior icon that empowers them to express their strength and sensuality.

Games have also explored both the positive and negative aspects of the animus. The valiant warrior overcoming the obstacles of his quest symbolizes the positive aspects of the animus.[28] Popular games with this theme include *Golden Eye 007* (1997), *Banjo-Kazooie* (1998), games in the *Zelda* series, and many others. Win or lose, in these games the hero succeeds in achieving a legendary status that overcomes the negative aspects of the animus.[29] The conflict between positive and negative animus aspects is the subject of most hand-to-hand combat games like *Mortal Kombat* (all versions), *Final Fantasy* (all versions), and *Tekken 3* (1997). The games emphasize the destruction of the antisocial and evil animus forms by the positive animus in hero form.

Rings, power crystals, perfect squares, and mandala-like spirals are also believed to be archetypes of the spiritual quest. Jaffe argues that these symbols emphasize the human quest for peace, spiritual centeredness, and an emerging sense of self.[30] The inclusion of these symbols in nearly all games suggests a preoccupation with themes of overcoming adversity, finding meaning, and becoming self-aware. Archetypes like these strongly connect to the most private aspects of the subconscious, causing emotional changes on a deeper and more personal level.

Only a brief summary of the possible interpretations of the rich imagery and embedded archetypal themes, this overview suggests an immense area for continued research and analysis. The games themselves have become an art form containing the cultural archetypes of all human knowledge. Because these themes connect with the innermost sense of self and the world, they perpetuate a distinctive culture and interpretation of reality that stands in stark contrast to the rigidity of our scientific, rational, modern world.

These archetypes are translated by the player's perception and adapted into his or her own personal archive of knowledge and interpretation. Admittedly, there are differences in how the archetypes are processed. Processing of this information is a product of age and physical development. Regardless of developmental level, however, video games have a profound power to draw us into an alternate reality and teach us to think in a different way.

While each player takes something unique away from the situation, games are also a democratic equalizer. Each copy of a game spreads a particular experience and alternate reality to each person who plays it. Because the sequence and resolution are identical (within certain parameters), the games become an acculturating force. The fact that gamers experience this archetypally enriched world sets them apart from non-gamers. With popular games selling millions of copies per year, it is easy to see how these become a part of collective social consciousness.

Questions still remain. Future research needs to systematically evaluate archetypal themes and content in all games. Gender differences in perception of the meaning of archetypes and awareness of their presence should also be evaluated. Empirical research also needs to be done in assessing the role of archetypally enriched games in affective response. The impact of game play in early childhood development, marital satisfaction, and parenting issues should also be closely examined. Finally, second-generation players should be carefully compared to first generation players in all areas. It is particularly the latter areas which will shed the most light on understanding the role that the video game archetypes play in video game culture.

Notes

1. T. Panelas, "Adolescents and Video Games," *Youth and Society* 15.1 (1983), pp. 51–65.

2. E. F. Provenzo, *Video Kids: Making Sense of Nintendo* (Cambridge, MASS.: Harvard University Press, 1991); P. M. Greenfield and R. R. Cocking, "Interacting with Video," *Advances in Applied Developmental Psychology* (1996), p. 11.

3. R. F. McClure, "Age and Video Game Playing," *Perceptual and Motor Skills* 61 (1985), pp. 285–286; R. F. McClure and F. G. Mears, "Video Game Players: Personality Characteristics and Demographic Variables," *Psychological Reports* 55 (1984), pp. 271–276.

4. Media Analysis Laboratory, "Video Game Culture: Leisure and Play Preferences of B.C. Teens" (Burnaby, B.C.: Simon Fraser University, 1998). Available from: www.media-awareness.ca/eng/issues/violence/resource/reports/vgames.html.

5. Based on the author's anecdotal and case study observation.

6. G. D. Gibb, J. R. Baily, T. T. Lambirth, and W. P. Wilson, "Personality Differences between High and Low Electronic Video Game Users," *Journal of Psychology* 114 (1983), pp. 159–165; E. A. Egli and L. S. Meyers, "The Role of Video Game Playing in Adolescent Life: Is There a Reason to Be Concerned?" *Bulletin of the Psychonomic Society* 22.4 (1984), pp. 309–312.

7. C. A. Anderson and M. Morrow, "Competitive Aggression without Interaction: Effects of Competitive vs. Cooperative Instructions on Aggressive Behavior in Video Games," *Personality and Social Psychology Bulletin* 28.10 (1995), pp. 1020–1030; M. D. Griffiths and N. Hunt, "Computer Game Playing in Adolescence: Prevalence and Demographic Indicators," *Journal of Community and Applied Social Psychology* 5 (1995), pp. 189–193.

8. J. H. Chambers and F. R. Ascione, "The Effect of Prosocial and Aggressive Video Games on Children's Donating and Helping," *Journal of Genetic Psychology* 148.4 (1987), pp. 499–505; J. Cooper and D. Mackie, "Video Games and Aggression in Children," *Journal of Applied Social Psychology* 16.8 (1986), pp. 726–744; J. R. Dominick, "Video Games, Television Violence and Aggression in Teenagers," *Journal of Communication* (Spring 1984), pp. 136–147; D. Graybill, M. Strawniak, T. Hunter, and M. O'Leary, "Effects of Playing versus Observing Violent versus Non-violent Video Games on Children's Aggression," *Psychology: A Quarterly Journal of Human Behavior* 24.3 (1987), pp. 1–8; N. S. Schutte, J. M. Malouff, J. C. Post-Gordon, and A. L. Rodasta, "Effects of Playing Video Games on Children's Aggressive and Other Behaviors," *Journal of Applied Social Psychology* 18.5 (1988), pp. 454–460; D. Scott, "The Effect of Video Games on Feelings of Aggression," *Journal of Psychology* 129.2 (1995), pp. 121–132.

9. C. A. Anderson and M. Morrow, "Competitive Aggression without Interaction: Effects of Competitive vs. Cooperative Instructions on Aggressive Behavior in Video Games," *Personality and Social Psychology Bulletin* 28.10 (1995), pp. 1020–1030; M. D. Griffiths and I. Dancaster, "The Effects of Type A Personality on Physiological Arousal While Playing Computer Games," *Addictive Behaviors* 20.4 (1995), pp. 543–548.

10. Ibid.

11. G. I. Kerstenbaum and L. Weinstein, "Personality, Psychopathology and Developmental

Issues in Male Adolescent Video Game Use," *Journal of the American Academy of Child Psychiatry* 24.3 (1985), pp. 329–337; M. D. Griffiths and I. Dancaster, "The Effects of Type A Personality on Physiological Arousal While Playing Computer Games," *Addictive Behaviors* 20.4 (1995), pp. 543–548; M. D. Griffiths and N. Hunt, "Computer Game Playing in Adolescence: Prevalence and Demographic Indicators," *Journal of Community and Applied Social Psychology* 5 (1995), pp. 189–193; S. Kline (Aug. 1998), "One in Four Young People Addicted to Video Games," *Globe and Mail*. Available: www.media-awarenesss.ca/eng/news/news/two/vidgame.html.

12. Based on the clinical issues brought up by the author's clients in outpatient psychotherapy.

13. B. F. Skinner, "Superstition in the Pigeon," *Journal of Experimental Psychology* 38 (1948), pp. 168–172.

14. A. Bandura, D. Ross, and S. A. Ross, "Transmission of Aggression through Imitation of Aggressive Models," *Journal of Abnormal Psychology* 63.3 (1961), pp. 575–582.

15. The author's research with four- and five-year-old preschoolers suggests that they will copy the behavior of picture-book characters they have heard about in recent stories. This is in keeping with Bandura's hypotheses but was not actually a part of Bandura's research. Bandura focused predominantly on live vs. media models.

16. C. J. Jung, ed., "Approaching the Unconscious," in *Man and His Symbols* (New York: Dell, 1968), pp. 1–94. (Original work published in 1964)

17. A. Jaffe, "Symbolism in the Visual Arts," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 255–322. (Original work published in 1964)

18. The preceding material draws heavily from C. J. Jung, "Approaching the Unconscious," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 1–94. (Original work published in 1964)

19. J. L. Henderson, "Ancient Myths and Modern Man," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 95–156. (Original work published in 1964)

20. C. J. Jung, "Approaching the Unconscious," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 1–94. (Original work published in 1964)

21. These behaviors have been systematically observed from behind a one-way mirror during the author's research on video gameplay behavior and physiological arousal in aggressive and skill gameplay.

22. These statements are from the personal communications of numerous clients and research subjects regarding educational, skill, or unengaging video games.

23. J. L. Henderson, "Ancient Myths and Modern Man," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 95–156. (Original work published in 1964)

24. C. J. Jung, "Approaching the Unconscious," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 1–94. (Original work published in 1964)

25. Ibid.

26. Ibid.; M. L. Von Franz, "The Process of Individuation," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 157–254. (Original work published in 1964)

27. Ibid.

28. J. L. Henderson, "Ancient Myths and Modern Man," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 95–156. (Original work published in 1964)

29. Ibid.

30. A. Jaffe, "Symbolism in the Visual Arts," in *Man and His Symbols*, ed. C. J. Jung (New York: Dell, 1968), pp. 255–322. (Original work published in 1964)

Appendix

Resources for Video Game Research

Mark J. P. Wolf

As with film or other media, firsthand experience is the best for research, yet while many video games can be purchased or rented, older ones can be more difficult to find. Arcades may feature a few older games which are still commercially viable and in working condition, but they are typically few and far between. Old home video games require old home game systems, and some old computer games can only be played on out-of-date computers (some games on the old Macintoshes, for example, cannot be run on today's models). Even finding such information as the year of release for an older video game can be hard. Some of the *PONG* imitations do not even feature a copyright date on the box of the game. But the number of resources for the video game researcher is growing. Below is a list of some of the better sources, a number of which were useful in doing the research for this book.

Videotopia

Keith Feinstein's Videotopia is a traveling museum exhibit including a wide range of arcade video games which patrons are able to play in an arcade-like setting. Historical information and displays put the games into context, and the collection of games represents all periods of arcade video game history, including *Computer Space*, the first arcade video game from 1971, an assortment of vector games, and laserdisc games, as well as new games. Videotopia is perhaps the only place where one can get firsthand experience of such a wide range of games and an overview of video game history. More information on the exhibit can be found at http://www.videotopia. com.

Home Video Games: The First Twenty-Five Years

This is an extensive list of home video games and game systems available from the author by e-mailing mark.wolf@cuw.edu.