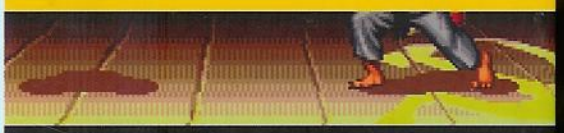
Katie Salen | Eric Zimmerman

Rules of Play

Game Design Fundamentals



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MEANINGFUL PLAY

meaning
designed choice
action
outcome
discernability
integration

3

We have only to watch young dogs to see that all the essentials of human play are present in their merry gambols. They invite one another to play by a certain ceremoniousness of attitude and gesture. They keep to the rule that you shall not bite, or not bite hard, your brother's ear. They pretend to get terribly angry. And—what is most important—in all these doings they plainly experience tremendous fun and enjoyment. Such rompings of young dogs are only one of the simpler forms of animal play. There are other, much more highly developed forms: regular contests and beautiful performances before an admiring public.

Here we have at once a very important point: even in its simplest forms on the animal level, play is more than a mere physiological phenomenon or a psychological reflex. It goes beyond the confines of purely physical or purely biological activity. It is a significant function—that is to say, there is some sense to it. In play there is something "at play" which transcends the immediate needs of life and imparts meaning to the action. All play means something.—**Johann Huizinga,** Homo Ludens

Introducing Meaningful Play

Johann Huizinga is one of the greatest scholars of play in the twentieth century. His groundbreaking book, *Homo Ludens,* is a unique investigation of the role of play in human civilization. The title is a play on *Homo Sapiens,* and translates as *Man the Player.* According to Huizinga, play and games, which have been maligned in recent history as trivial and frivolous, are in fact at the very center of what makes us human. "Play is older than culture," as Huizinga puts it, and *Homo Ludens* is a celebration of play that links the visceral, combative nature of contest directly to war, poetry, art, religion, and other essential elements of culture. *Homo Ludens* is, in many ways, an attempt to redefine and elevate the significance of play.

Huizinga's vision of play offers a perfect point of departure for the development of the concept of meaningful play. We begin with a close reading of one section of the opening passage from *Homo Ludens:*

> It [play] is a significant function—that is to say, there is some sense to it. In play there is something "at play" which transcends the immediate needs of life and imparts meaning to the action. All play means something.[1]

Huizinga emphasizes the fact that all play means something, that there is "sense" to play, that it transcends. The idea that "all play means something" is a wonderfully complex statement we can interpret in a variety of ways. In fact, all of the following are possible readings of the text:

- Huizinga says that play is a *significant function.* Does this mean that play is an important (and possibly unrecognized) force in culture—that it is significant in the way that art and literature are? Or does he mean that play *signifies*—that it is a symbolic act of communication?
- He mentions that there is *some sense* to play. Does he mean that play isn't soley chaotic, but is instead an event that can be understood and analyzed if one looks closely enough? Or is he implying that sense itself (the opposite of nonsense) is something intrinsically related to play?
- There's the complex statement: *In play there is something "at play."* Does Huizinga mean that there is always something deeper "at play," which constitutes any instance of play we observe in the real world? Or that in play something is always in motion, never fixed, and in a constant state of transformation?
- This "at play" quality of play *transcends the immediate needs of life.* Does the word "transcend" imply something spiritual? Or does Huizinga simply mean that play creates an artificial space beyond that of ordinary life?
- The same "at play" characteristic of play *imparts meaning to the action.* Does the fact that play is always "at play" relate to the meaning of the action? Or does it imply that play must be understood as one element of a more general system out of which meaning grows?
- The passage concludes with the sentence, *All play means something.* But what does play mean? To who or what is it meaningful? What is the process by which meaning emerges from play?

These are complex and multi-layered questions, lacking definitive answers. In some sense, each of the interpretations posed are implied in Huizinga's statement, and all of them point to key aspects of play and play's participation in the creation of meaning. These important questions, and their possible answers, contain all of the main themes of this book. We will, in the pages that follow, investigate the intricate relationships among game design, play, and meaning.

Meaning and Play

Meaning, meaning, meaning. If you repeat the word enough, you can almost coax it into the realm of pure non-sense. Because asking about the meaning of meaning can quickly turn into a jumbled, meaningless mess, let's frame the connection between play and meaning as simply as we can. In the game of Pong, for example, the meaning of the interaction between player and game is mediated by play, from the play of

pixels representing the ball, to the play of the mechanical knobs controlling the digital paddles, to the competitive social force of play between opponents. It is for these reasons, and many others, that game designers should care about the relationship between meaning and play.

Learning to create great game experiences for players—experiences that have meaning and are meaningful—is one of the goals of successful game design, perhaps the most important one. We call this goal the design of *meaningful play,* the core concept of our approach. This concept is so critical to the rest of this chapter that we are going to repeat ourselves: *the goal of successful game design is the creation of meaningful play.* Meaningful play is that concept which can address all of the "unanswerable" questions raised by Huizinga. It is also a concept that raises questions of its own, challenging assumptions we might have about the role of design in shaping play.

One of the difficulties in identifying meaningful play in games is the near-infinite variety of forms that play can take. Here are some examples:

- the intellectual dueling of two players in a well-met game of Chess
- the improvisational, team-based balletics of Basketball
- the dynamic shifting of individual and communal identities in the online role-playing game EverQuest
- the lifestyle-invading game Assassin, played on a college campus

What do all of these examples have in common? Each situates play within the context of a game. Play doesn't just come from the game itself, but from the way that players interact with the game in order to play it. In other words, the board, the pieces, and even the rules of Chess can't alone constitute meaningful play. Meaningful play emerges from the interaction between players and the system of the game, as well as from the context in which the game is played. Understanding this interaction helps us to see just what is going on when a game is played. One way of framing what players do when they play a game is to say that they are making choices. They are deciding how to move their pieces, how to move their bodies, what cards to play, what options to select, what strategies to take, how to interact with other players. They even have to make the choice whether or not to play!

When a player makes a choice within a game, the action that results from the choice has an outcome In Chess, if a player moves a piece on the board, this action affects the relationships of all of the other pieces: one piece might be captured, or a king might suddenly find itself in check. In Assassin, if a player stealthily stalks her target and manages to shoot him with a dart gun, the overall game changes as a result of this action: a hit is scored, the victim is out for the rest of the game, and he must give *his* target name to the player that just shot him. In EverQuest, if you engage with and kill a monster, the stats and equipment of your character can change; the larger game-world is affected as well, even if it simply means that for the moment there is one less monster.

Playing a game means making choices and taking actions. All of this activity occurs within a game-system designed to support meaningful kinds of choice-making. Every action taken results in a change affecting the overall system of the game. Another way of stating this point is that an action a player takes in a game results in the creation of new meanings within the system. For example, after you move a piece in Chess, the newly established relationships between Chess pieces gives rise to a new set of meanings—meanings created by the player's action.

Two Kinds of Meaningful Play

We define meaningful play in two separate but related ways. The first sense of meaningful play refers to the way game actions result in game outcomes to create meaning. Framing the concept in this way, we offer the following definition:

Meaningful play **in a game emerges from the relationship between player action and system outcome; it is the process by which a player takes action within the designed system of a game and the system responds to the action. The *meaning* of an action in a game resides in the relationship between action and outcome.**

Think about an informal game of "Gross-Out" played during an elementary school recess. One by one, players tell a gross-out story, each tale more disgusting than the last. When a story is finished, the group spontaneously and collectively responds, confirming or denying the player's position as master of the playground, until an even grosser story is told.

If we look at Gross-Out from the perspective of meaningful play we see that a player takes an action by telling a story. The *meaning* of the action, as a move in a game, is more than the narrative content of the story. It is also more than the theatrics used to tell the story. The outcome of the storytelling action depends on the other players and their own voting actions. Meaningful play emerges from the collective action of players telling and rating stories. The *meaning* of the story, in the sense of meaningful play, is not just that Hampton told a whopper about his big sister eating a live beetle—it is that Hampton's story has beaten the others and he is now the undisputed Gross-Out king.

This way of understanding meaningful play refers to the way *all* games generate meaning through play. Every game lets players take actions, and assigns outcomes to those actions. We therefore call this definition of meaningful play *descriptive,* because it describes what happens in every game. This is our first understanding of meaningful play.

At the same time, some games create more meaningful play than other games: the design of some games generates truly meaningful experiences for players, whereas other, less successful game designs result in experiences that somehow fall short. Even if meaningful play is a goal that we strive to achieve in our games, sometimes we don't quite get it right. So, in addition to our descriptive understanding of meaningful play, which describes what happens in all games, we need something that will help us be more selective in determining when meaningful play occurs.

This is the second sense of meaningful play. Instead of being a description of the way games operate, it refers to the goal of successful game design. This sense of meaningful play is *evaluative:* it helps us critically evaluate the relationships between actions and outcomes, and decide whether they are meaningful enough within the designed system of the game:

Meaningful play **occurs when the relationships between actions and outcomes in a game are both *discernable* and *integrated* into the larger context of the game. Creating meaningful play is the goal of successful game design.**

The word "meaningful" in this sense is less about the semiotic construction of meaning (how meaning is made) and more about the emotional and psychological experience of inhabiting a well-designed system of play. In order to understand why some play in games is more meaningful than others, we need to understand the key terms in the definition: *discernable* and *integrated.*

Discernable

Discernable means that the result of the game action is communicated to the player in a perceivable way. In the following excerpt from *Game Design: Theory and Practice,* Richard Rouse III points out the importance of displaying discernable information to the player within the context of the game world. His example looks explicitly at computer games where there is an obvious need to condense massive amounts of data into a representative form that can be clearly communicated to the player. However, the idea of discernable outcomes applies to all games, digital or otherwise. Rouse writes,

> Consider a strategy game in which the player has a number of units scattered all over a large map. The map is so large that only a small portion of it can fit on the screen at once. If a group of the

player's units happen to be off-screen and are attacked but the player is not made aware of it by the game, the player will become irritated. Consider an RPG where each member of the player's party needs to be fed regularly, but the game does not provide any clear way of communicating how hungry his characters are. Then, if one of the party members suddenly keels over from starvation, the player will become frustrated, and rightly so. Why should the player have to guess at such game-critical information?[2]

If you shoot an asteroid while playing a computer game and the asteroid does not change in any way, you are not going to know if you actually hit it or not. If you do not receive feedback that indicates you are on the right track, the action you took will have very little meaning. On the other hand, if you shoot an asteroid and you hear the sound of impact, or the asteroid shudders violently, or it explodes (or all three!) then the game has effectively communicated the outcome of your action. Similarly, if you move a board game piece on the board but you have absolutely no idea whether your move was good or bad or if it brought you closer to or farther away from winning—in short, if you don't know the meaning of your action—then the result of your action was not discernable. Each of these examples makes clear that when the relationship between an action and the result of that action is not discernable, meaningful play is difficult or impossible to achieve.

Discernability in a game lets the players know *what* happened when they took an action. Without discernability, the player might as well be randomly pressing buttons or throwing down cards. *With* discernability, a game possesses the building blocks of meaningful play.

Integrated

Another component of meaningful play requires that the relationship between action and outcome is *integrated* into the larger context of the game. This means that an action a player takes not only has immediate significance in the game, but also affects the play experience at a later point in the game. Chess is a deep and meaningful game because the delicate opening moves directly result in the complex trajectories of the middle game—and the middle game grows into the spare and powerful encounters of the end game. Any action taken at one moment will affect possible actions at later moments.

Imagine a multi-event athletic game, such as the Decathlon. At the start of the game, the players run a footrace. What if the rules of the game dictated that winning the footrace had nothing to do with the larger game? Imagine what would happen: the players would walk the race as slowly as possible, trying to conserve energy for the other, more meaningful events. Why should they do anything else? Although one of them will win the footrace, it will have no bearing on the larger game. On the other hand, if the players receive points depending on how well they rank and these points become part of a cumulative score, then the actions and the outcomes of the footrace are well integrated into the game as a whole.

Whereas discernability of game events tells players *what* happened *(I hit the monster)*, integration lets players know *how* it will affect the rest of the game *(If I keep on hitting the monster I will kill it. If I kill enough monsters, I'll gain a level.)*. Every action a player takes is woven into the larger fabric of the overall game experience: this is how the play of a game becomes truly meaningful.

Meaningful play can be realized in a number of ways, depending on the design of a particular game. There is no single formula that works in every case. In the example of the asteroid shooting game, immediate and visceral feedback was needed to make the action discernable. But it might also be the case that in a story-based game, the results of an action taken near the beginning of the game are only understood fully at the very end, when the implications are played out in a very unexpected and dramatic way. Both instances require different approaches to designing meaningful play.

Meaningful play engages several aspects of a game simultaneously, giving rise to layers of meaning that accumulate and shape player experience. Meaningful play can occur on the formal, mathematically strategic level of a single move in Chess. It can occur on a social level, as two players use the game as a forum for meaningful communication. And it can occur on larger stages of culture as well, where championship Chess matches can be used as occasions for Cold War political propaganda, or in contemporary philosophical debates about the relative powers of the human mind and artificial intelligence.

The next three chapters elaborate on the many ways that game designers construct spaces of meaningful play for players. Among the many topics we might select, we cover three core concepts that form several of the fundamental building blocks of game design: *design*, *systems*, and *interactivity*.

Notes

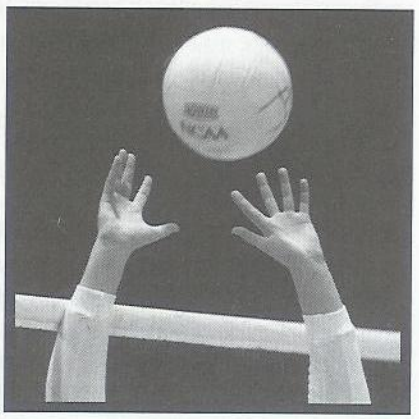
1 Johann Huizinga, *Homo Ludens: A Study of the Play Element in Culture* (Boston: Beacon Press, 1955), p. 446.

2 Richard Rouse III, *Game Design: Theory and Practice* (Plano, TX: Wordware Publishing, 2001), p 141.

Meaningful Play SUMMARY

- Meaning, play, and games are intimately related concepts. The goal of successful game design is **meaningful play.**
- There are two ways to define meaningful play: **descriptive** and **evaluative.** The descriptive definition addresses the mechanism by which all games create meaning through play. The evaluative definition helps us understand why some games provide more meaningful play than others.
- The **descriptive** definition of meaningful play: **Meaningful play** in a game emerges from the relationship between player action and system outcome; it is the process by which a player takes action within the designed system of a game and the system responds to the action. The *meaning* of an action in a game resides in the relationship between action and outcome.
- The **evaluative** definition of meaningful play: **Meaningful play** is what occurs when the relationships between actions and outcomes in a game are both **discernable** and **integrated** into the larger context of the game.
- **Discernability** means that a player can perceive the immediate outcome of an action. **Integration** means that the outcome of an action is woven into the game system as a whole.
- The two ways of defining meaningful play are closely related. Designing successful games requires understanding meaningful play in both senses.

INTERACTIVITY



action > outcome
four modes of interactivity
anatomy of a choice
internal event
external event
space of possibility

6

The word "interactivity" isn't just about giving players choices; it pretty much completely defines the game medium.—**Warren Spector,** *RE:PLAY: Game Design + Game Culture*

Hotrod joystick | | Volleyball

Introducing Interactivity

Play implies interactivity: to play with a game, a toy, a person, an idea, is to interact with it. More specifically, playing a game means making choices within a game system designed to support actions and outcomes in meaningful ways. Every action results in a change affecting the overall system. This process of action and outcome comes about because players interact with the designed system of the game. Interaction takes place across all levels, from the formal interaction of the game's objects and pieces, to the social interaction of players, to the cultural interaction of the game with contexts beyond its space of play.

In games, it is the explicit interaction of the player that allows the game to advance. From the interactivity of choosing a path to selecting a target for destruction to collecting magic stars, the player has agency to initiate and perform a whole range of explicit actions. In some sense, it is these moments of explicit action that define the tone and texture of a specific game experience. To understand this particular quality of games—the element of interaction—we must more completely grasp the slippery terms "interactive," "interaction," and "interactivity."

Defining Interactivity

Perhaps even more than "design" and "systems," debates over the term "interactivity" have run rampant. Interactivity is one of those words that can mean everything and nothing at once. If everything can indeed be considered interactive, then the concept loses its ability to help us solve design problems. In corralling this runaway word, our aim is to try and understand it in its most general sense, but also to identify those very particular aspects of interactivity that are relevant to games. To this end, we look at several definitions of interactivity. We begin with a general question: What is *"interaction?"* Here are some basic dictionary definitions:

- *interaction* 1 intermediate action, 2 mutual or reciprocal action or influence,
- *interact.* to act on each other; act reciprocally;
- *interactive.* reciprocally active; acting upon or influencing each other; allowing a two-way flow of information between a device and a user, responding to the user's input [1]

In the most general terms, interactivity simply describes an active relationship between two things. For our purposes, however, we require a slightly more rigorous definition, one that takes into account the particular nature of games. Instead of asking about interactivity in the abstract, what does it mean to say that something is "interactive?" More specifically, how does interactivity emerge from within a *system?*

Communications theorist Stephen W. Littlejohn defines interactivity this way: "Part and parcel of a system is the notion of 'relationship'. . . Interactional systems then, shall be two or more communicants in the process of, or at the level of, defining the nature of their relationship."[2] In other words, something is interactive when there is a reciprocal relationship of some kind between two elements in a system. Conversations, databases, games, and social relationships are all interactive in this sense. Furthermore, relationships between elements in a system are defined through interaction.

Following this definition, digital media theorist and entrepreneur Brenda Laurel brings the concept of *representation* to an understanding of the term: "...something is interactive when people can participate as agents within a representational context. (An agent is 'one who initiates actions.')"[3] Laurel's model emphasizes the interpretive component of interactive experiences, framing an interactive system as a representational space.

In an alternative definition of interactivity, theorist Andy Cameron builds on this interpretive dimension by stressing the idea of *direct intervention.* In his essay "Dissimulations," Cameron writes that

> Interactivity means the ability to intervene in a meaningful way *within the representation itself,* not to *read* it differently Thus interac-

> tivity in music would mean the ability to change the sound, interactivity in painting to change colors, or make marks, interactivity in film .the ability to change the way the movie comes out."[4]

Cameron suggests a connection between interactivity and *explicit action,* a key feature of games and meaningful play. In some sense, it is these moments of explicit action that define the tone and texture of a specific game experience.

A final definition comes from game designer Chris Crawford, who metaphorically defines interactivity in terms of a conversation: "Interactivity: a cyclical process in which two actors alternately listen, think, and speak. The quality of interaction depends on the quality of each of the subtasks (listening, thinking, and speaking)."[5]

While his definition hearkens back to Littlejohn's relational model, Crawford's definition stresses the *iterative quality* of interactivity. He uses the following example for emphasis:

> A conversation, in its simplest form, starts out with two people, Joe and Fred Joe says something to Fred. At this point, the ball is in Fred's court He performs three steps in order to hold up his end of the conversation.
>
> *Step One:* Fred listens to what Joe has to say. He expends the energy to pay attention to Joe's words. He gathers in all of Joe's words and assembles them into a coherent whole This requires an active effort on Fred's part
>
> *Step Two.* Fred thinks about what Joe said He considers, contemplates, and cogitates. The wheels turn in his mind as Fred develops his response to Joe's statement
>
> *Step Three* Fred expresses his response back to Joe He forms his thoughts into words and speaks them.
>
> Now the tables are turned, the ball is in Joe's court. Joe must listen to what Fred says, Joe must think about it and develop a reaction, then he must express his reaction to Fred This process cycles back and forth Thus, a conversation is an iterative process in which each participant in turn listens, thinks, and speaks [6]

Each of these definitions provides its own critical way of understanding interactivity: it takes place within a system, it is relational, it allows for direct intervention within a representational context, and it is iterative. Yet none of the definitions describes how and where interactivity can take place, and none of them address the relationship between structure and context, two key elements in the construction of meaning. These questions of the "how," "where," and "by whom" are critical to anyone faced with the challenge of designing interactivity.

In other words, none of these definitions resolve the question of whether or not all media, or even all experiences, are interactive. If interactivity is really so ubiquitous, can it possibly be a useful term for understanding games?

A Multivalent Model of Interactivity

Each of the previous definitions foreground a particular aspect of interaction; in our view, they are all are useful ways of defining interactivity. Rather than try and distill them into a composite definition, we have elected instead to offer a model of interactivity that accommodates each of these definitions. The model presents four modes of interactivity, or four different levels of engagement, that a person might have with an interactive system. Most "interactive" activities incorporate some or all of them simultaneously.

***Mode 1:** Cognitive interactivity; or interpretive participation*
This is the psychological, emotional, and intellectual participation between a person and a system. Example: the complex imaginative interaction between a single player and a graphic adventure game.

***Mode 2:** Functional interactivity; or utilitarian participation*
Included here: functional, structural interactions with the material components of the system (whether real or virtual). For example, that graphic adventure you played: how was the interface? How "sticky" were the buttons? What was the response time? How legible was the text on your high-resolution monitor? All of these elements are part of the total experience of interaction.

Mode 3: Explicit interactivity; or participation with designed choices and procedures

This is "interaction" in the obvious sense of the word: overt participation like clicking the non-linear links of a hypertext novel, following the rules of a board game, rearranging the clothing on a set of paper dolls, using the joystick to maneuver Ms. Pac-Man. Included here: choices, random events, dynamic simulations, and other procedures programmed into the interactive experience.

Mode 4: Beyond-the-object-interactivity; or participation within the culture of the object

This is interaction outside the experience of a single designed system. The clearest examples come from fan culture, in which participants co-construct communal realities, using designed systems as the raw material. Will Superman come back to life? Does Kirk love Spock?

Some of these modes occur universally in human experience, such as Mode 1, cognitive interactivity. Yet not all of them do. For our purposes, Mode 3, explicit interactivity, comes closest to defining what we mean when we say that games are "interactive." An experience becomes truly interactive in the sense of Cameron's "direct intervention" only when the participant makes choices that have been designed into the actual structure of the experience.

The rest of this chapter focuses primarily on explicit interactivity and how game designers can create the kinds of choices that result in meaningful play. However, even though we will be focusing on Mode 3, it is important to remember that the other three modes of interactivity are also present as players make explicit choices. For example, choosing whether to fold or not in Poker represents a moment of explicit interactivity. But at the same time, the material quality and size of the cards affect the functional interactivity; the fanciful images on the face cards might engender cognitive interactivity; and notions about what it means to be a suave card shark—or perhaps resentment at being trounced at the Poker table last week—represent forms of cultural participation that lie outside the bounds of the particular game being played.

Interaction, even the explicit interaction of a seemingly straightforward game choice, is never as simple as it appears at first glance. But before we dissect the components of explicit interactive choices, let's pause to consider the role of design itself in creating interactivity.

But Is it "Designed" Interaction?

Interaction comes in many forms. But for the purposes of designing interactivity, it is important to be able to recognize what forms of interactivity designers create. As an example, compare the following two actions: someone dropping an apple on the ground and someone rolling dice on a craps table. Although both are examples of interaction proper, only the second act, the rolling of the dice, is a form of designed interaction.

What about this action has been designed? First, the dice, unlike the apple, are part of a system (a game) in which the interaction between the player and the dice is made meaningful by a set of rules describing their relationship. This relationship, as defined by the rules of Craps, describes the connection between action and outcome—for example, "When the dice are rolled a player counts the number of dots appearing on the face-up sides of the dice." Even this extremely simple rule demonstrates how the act of rolling has meaning within the designed interactive system of the game. Secondly, the interaction is situated within a specific context: a game Remember that meaningful play is tied not only to the concept of player action and system outcome, but also to a particular context in which the action occurs.

The description of "someone dropping an apple on the ground," on the other hand, does not contain a designed structure or context. What conditions would have to be present to evolve this simple interaction into a designed interaction? The

dropping of the apple does meet baseline criteria for interaction: there is a reciprocal relationship between the elements of the system (such as the person's hand, the apple, and the ground). But is it a designed interaction? Is the interactivity situated within a specific context? Do we have any ideas about what dropping an apple might "mean" as a form of interaction between a person and an apple? Do we have a sense of the connection between action and outcome?

No. All we know is that an apple has been dropped. What is missing from this description is an explicitly stated context within which the dropping of the apple occurs. If we change the scenario a little by adding a second player and asking the two participants to toss the apple back and forth, we move toward a situation of designed interaction. If we ask the two apple-tossers to count the number of times in a row they caught the apple before dropping it, we add an even fuller context for the interaction. The simple addition of a rule designating that the players quantify their interaction locates the single act of toss-catch within an overall system. Each element in the system is assigned a meaning: the toss, the catch, and the dropped toss. Even in the simplest of contexts, design creates meaning.

Interaction and Choice

The careful crafting of player experience through a system of interaction is critical to the design of meaningful play Yet, just what makes an interactive experience "meaningful"? We have argued that in order to create instances of meaningful play, experience has to incorporate not just explicit interactivity, but meaningful *choice*. When a player makes a choice in a game, the system responds in some way. The relationship between the player's choice and the system's response is one way to characterize the depth and quality of interaction. Such a perspective on interactivity supports the descriptive definition of meaningful play presented in chapter 3.

In considering the way that choices are embedded in game activity, we look at the design of choice on two levels: micro and macro. The *micro* level represents the small, moment-to-moment choices a player is confronted with during a game. The *macro* level of choice represents the way these micro-choices join together like a chain to form a larger trajectory of experience. For example, this distinction marks the difference between tactics and strategy in a game such as Go. The *tactics* of Go concern the tooth-and-nail battles for individual sectors of the board, as individual pieces and small groups expand across territory, bumping up against each other in conflict and capture. The *strategy* of the game is the larger picture, the overall shape of the board that will ultimately determine the winner. The elegance of the design of Go lies in its ability to effortlessly link the micro and the macro, so that every move a player makes works simultaneously on both levels. Micro-interaction and macro-interaction are usually intertwined and there are, of course, numerous shades of gray in-between.

Keep in mind that "choice" does not necessarily imply *obvious* or *rational* choice, as in the selection of an action from a menu. Choice can take many forms, from an intuitive physical action (such as the "twitch" firing of a Time Crisis pistol) to the random throw of a die. Following are a few more examples of designed choices in games.

The choice of whether or not to take a hit in Blackjack. A Blackjack player always has a clear set of choices: the micro-choice of taking or not taking a hit will have the eventual outcome of a win or a loss against the house. On the macro-level, each round affects the total amount of money the player gains or loses over the course of the game. Playing each hand separately, according to its probability of beating the house is like tactics in Go Counting cards, which links all of a players' hands between rounds, is a more long-term, strategic kind of choice-making

The choice of what to type into the flashing cursor of a text adventure. This is a more open-ended choice context than the simple hit or pass of Blackjack. The micro-choice of typing in a command gives the player feedback about

how the player moves through or changes the world. The choice to type the words "Move North" takes the player to another location in the game where different actions are possible—perhaps actions that will eventually solve the multi-part puzzles that exist on the macro-level of game play. Even when a player tries to take an action that the program cannot parse (such as typing "grab rock" instead of "get rock"), it is meaningful: the outcome of bumping up against the limits of the program's parsing ability serves to further delineate the boundaries of play.

The choice of what play to call in a Football game. This moment of game-choice is often produced collaboratively among a coaching staff, a quarterback, and the rest of the offensive players. There are a large number of possible plays to call, each with variations, and the choice is always made against the backdrop of the larger game: the score, the clock, the field position, the down, the strengths and weaknesses of both teams. The most macro-level of choices address the long-term movement of the ball across the field and the two teams' overall scores. The most micro-level of choices occur once the play is called and the ball is hiked: every offensive player has the moment-to-moment challenge of executing the play as the defensive team does its best to put a stop to it

As these examples demonstrate, choice-making is a complex, multi-layered process. There is a smooth transition between the micro- and macro-levels of choice-making, which play out in an integrated way for the player. When the outcome of every action is discernable and integrated, choice-making leads to meaningful play. Game designer Doug Church, in his influential online essay "Formal Abstract Design Tools," outlines the way that these levels of choice transition into a complete game experience.

> In a fighting game, every controller action is completely consistent and visually represented by the character on-screen. In Tekken, when Eddy Gordo does a cartwheel kick, you know what you're going to get. As the player learns moves, this consistency allows planning—intention—and the reliability of the world's reactions makes for perceived consequence. If I watch someone play, I can see how and why he or she is better than I am, but all players begin the game on equal footing.[7]

As Church points out, the macro-levels of choice-making include not only what to do over the course of a game, but also whether or not you want to play a game, and against whom. If you are beaten in a fighting game that doesn't contain clear and meaningful play, you will never know why you lost and you will most likely not play again. On the other hand, if you know why your opponent is better than you are, your loss is meaningful, as it helps you assess your own abilities, gives you ideas for improvement, and spurs on your overall interaction with the game.

Choice Molecules

> *[The designers of Spacewar!, the first computer game] identified action as the key ingredient and conceived Spacewar! as a game that could provide a good balance between thinking and doing for its players. They regarded the computer as a machine naturally suited for representing things that you could see, control, and play with. Its interesting potential lay not in its ability to perform calculations but in its capacity to represent action in which humans could participate.*—**Brenda Laurel,** *Computers as Theater*

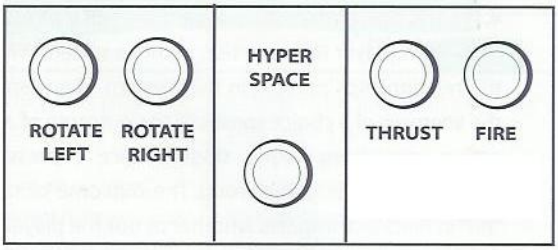
The capacity for games to "represent action in which players participate" forms the basis of our concept of "choice." If we consider that every choice has an outcome, then it follows that this action > outcome unit is the vehicle through which meaning in a game emerges. Although games can generate meaning in

many ways (such as through image, text, sound, etc.), to understand the interactive nature of meaningful play, we focus on the kinds of meaning that grow from player interaction. At the heart of interactive meaning is the action > outcome unit, the molecule out of which larger interactive structures are built.

In order to examine this concept more closely we look at the classic arcade game Asteroids, a direct descendent of Spacewar!. In Asteroids, a player uses buttons to maneuver a tiny spaceship on the screen, avoiding moving asteroids and UFOs and destroying them by shooting projectiles. The action > outcome interactive units of Asteroids are manipulated through a series of five player commands, each one of them a button on the arcade game's control panel: rotate left, rotate right, thrust, fire, and hyperspace. Within the scope of an individual game, possible player actions map to the five buttons:

- **Press rotate right button:** spaceship rotates right
- **Press rotate left button:** spaceship rotates left
- **Press thrust button:** spaceship accelerates in the direction it is facing
- **Press fire button:** spaceship fires projectile (up to four on the screen at a time)
- **Press hyperspace button:** spaceship disappears and reappears in a different location (and occasionally perishes as a result)

Action on the screen is affected through the subtle (and not so subtle!) orchestration of these five controls. As the game progresses, each new moment of choice is a response to the situation onscreen, which is the result of a previous string of action > outcome units. The seamless flow that emerges is one of the reasons why Asteroids is so much fun to play. Rarely are players aware of the hundreds of choices they make each minute as they dodge space rocks and do battle with enemy ships—they perceive only their excitement and participation inside the game.



Anatomy of a Choice

Although the concept of choice may appear basic upon first glance, the way that a choice is actually constructed is surprisingly complex. To dissect our action > outcome molecule, we need to ask the following five questions. Together, they outline the *anatomy of a choice*.

1. What happened before the player was given the choice? What is the current state of the pieces on a game board, for example, or the level of a player's health? What set of moves just finished playing out? What is the game status of the other players? This question relates to the both the micro and macro events of a game, and addresses the context in which a choice is made.

2. How is the possibility of choice conveyed to the player? On a game board, the presence of empty squares or a "draw pile" might indicate the possibility of choice, whereas choices in a digital game are often conveyed through the game's controls. In Asteroids, for example, the five buttons on the control panel communicate the opportunity for choice-making to the player.

3. How did the player make the choice? Did the player make a choice by playing a card, pressing a button, moving a mouse, running in the opposite direction, or passing on a turn? The mechanisms a player uses to make a choice vary greatly, but all are forms through which players are given the opportunity to take action.

4. What is the result of the choice? How will it affect future choices? A player taking action within a system will affect the relationships present in that system. This element of the anatomy of a choice speaks to the outcome of a player action, identifying how a single choice impacts larger events within the game world. The outcome of taking a "hit" in Blackjack impacts whether or not the player wants to take another hit, as well as the outcome of the game.

5. How is the result of the choice conveyed to the player? The means by which the results of a choice are represented to a player can assume many guises, and forms of representation are often related to the materiality of the game itself. In a game of Twister, for example, the physical positioning of bodies in space conveys the results of choices; in Missile Command, the result of the choice to "fire" is conveyed by a slowly moving line of pixels, ending in an explosion; in Mousetrap, the mechanical workings (or non-workings) of the mousetrap convey the results of moving a mouse into the trap space. Note that step 5 leads seamlessly back to step 1, because the result of the choice provides the context for the next choice.

These are the five stages of a choice, the five events that transpire every time an action and outcome occur in a game. Each stage is an event that occurs internal or external to the game. *Internal events* are related to the systemic processing of the choice; *external events* are related to the representation of the choice to the player. These two categories make a distinction between the moment of action as handled by the internal game state and the manifestation of that action to the player.

The idea that a game can have an internal event represented externally implies that games are systems that store information. Jesper Juul, in a lecture titled "Play Time, Event Time, Themability," describes this idea by thinking of a game as a state machine:

> A game is actually what computer science describes as a state machine. It is a system that can be in different states. It contains input and output functions, as well as definitions of what state and what input will lead to what following state. When you play a game, you are interacting with the state machine that is the game. In a board game, this state is stored in the position of the pieces on the board, in computer games the state is stored as variables, and then represented on the screen.[8]

In Juul's example of a board game, the "internal" state of the game is immediately evident to the players in the way that the pieces are arranged on the board. In the case of a computer game, as Juul points out, the internal variables have to be translated into a representation for the player. The distinction between internal and external events helps us to identify and distinguish the components of a choice. Within the action > outcome molecule, stages 1, 3, and 4 are internal events, and

Anatomy of a choice

1. What happened before the player was given the choice?
(internal event)

↓

2. How is the possibility of choice conveyed to the player?
(external event)

↓

3. How did the player make the choice?
(internal event)

↓

4. What is the result of the choice? How will it affect future choices?
(internal event)

↓

5. How is the result of the choice conveyed to the player?
(external event)

Figure 1

Anatomy of a Choice	Asteroids	Chess
1. What happened before the player was given the choice? (internal event)	Represented by the current positions and trajectories of the game elements	Represented by the current state of the pieces on the board
2. How is the possibility of choice conveyed to the player? (external event)	The possible actions are conveyed through the persistent button controls as well as the state of the screen, as it displays the relationships of the game elements	The possible actions are conveyed through the arrangement of pieces on the board, including the empty squares where they can move
3. How did the player make the choice? (internal event)	The player makes a choice by pressing one of the 5 buttons	The players makes a choice by moving a piece
4. What is the result of the choice? How will it affect future choices? (internal event)	Each button press affects the system in a different way, such as the position or orientation of the player's ship	Each move affects the overall system, such as capturing a piece or shifting the strategic possibilities of the game
5. How is the result of the choice conveyed to the player? (external event)	The result of the choice is then represented to player via screen graphics and audio	The result of the choice is then represented to the player via the new arrangement of pieces on the board

stages 2 and 5 are external events. These two layers of events form the framework within which the anatomy of a choice must be considered. To see how this all fits together, let us take an even closer look at the way choice is constructed in two of our example games, Asteroids and Chess. *(Figure 1)*

Although all five stages of the action > outcome choice event occurred in both games, there are some significant differences. In Asteroids, the available choices and the taking of an action both involve static physical controls. In Chess, the pieces on the board serve this function, even as they convey the current state of the game. The internal and external states of Chess are identical, but in Asteroids, what appears on the screen is only an outward extension of the internal state of the software. The "anatomy of a choice" structure occurs in every game, although each game will manifest choice in its own way.

This way of understanding choice in a game can be extremely useful in diagnosing game design problems. If your game is failing to deliver meaningful play, it is probably because there is a breakdown somewhere in the action > outcome chain. Here is a sample list of common "failure states" that can often be found in games and the way that they relate to the stages of a choice.

- *Feeling as if decisions are arbitrary.* If you need to play a card from your hand and it always feels like it doesn't matter which card you select, the game probably suffers in stage 4, the effect of the player's choice on the system of the game. The solution is to make sure that player actions have meaningful outcomes in the internal system of the game.

- *Not knowing what to do next.* This can be a common problem in large digital adventure games, where it is not clear how a player can take action to advance the game. The problem is in stage 2, representing choices to the player. These kinds of problems are often solved with additional information display, such as highlights on a map, or an arrow or indicator that helps direct the player.
- *Losing a game without knowing why.* You think that you're about to reach the top of the mountain, when your character dies unexpectedly from overexposure. This frustrating experience can come about because a player has not sufficiently been informed about the current state of the game. The problem might be in stage 5, where the new state of the game resulting from a choice is not represented clearly enough to the player.
- *Not knowing if an action had an outcome.* Although this sounds like something that would never happen, there are many examples of experimental interactivity (such as a gallery-based game with motion sensor inputs) in which the player never receives clear feedback on whether or not an action was taken. In this case, there is a breakdown at stages 3 and 4, when a player is taking an action and receiving feedback on the results.

These examples represent only a small sampling of the kinds of problems that a game's design can have. The anatomy of a choice is not a universal tool for fixing problems, but it can be especially useful in cases where the game is breaking down because of a glitch in the player's choice-making process.

Space of Possibility

We conclude this chapter with an excerpt from David Sudnow's book, *Pilgrim in a Microworld,* a wonderfully detailed personal account of one man's very real obsession with the video game Breakout. Sudnow brings readers into the space of designed interactivity through detailed descriptions of what he experienced—physically, psychologically, emotionally—as he played. There are remarkably few documents that offer such a sensitive and insightful analysis of designed interaction.

> I'd catch myself turning my chair into a more en face position vis-à-vis the TV. An obvious delusion. Maybe I could rest one elbow on the set to help feel the angle of my look and deepen a sense for the scale of things. See it from this side and that, see the invisible backside of things through an imaginary bodily tour of the object. Nonsense. If only I could feel the impact of the ball on the paddle, that would certainly help, would give me a tactile marker, stamping the gesture's places into a palpable little signature so I'd feel each destination being achieved and not just witness the consequences of a correct shot. Nonsense.
>
> Non-sense, just your eyes way up top, to be somehow fixed on things in ways that can't feel them fixing, then this silent smooth little plastic knob down there, neither near nor far away but in an untouchable world without dimensions. And in between all three nodes of the interface there's nothing but a theory of electricity. So fluid, to have to write your signature with precise consistency in size within the strict bounds of a two and three-sevenths of an inch of space, say, while the pen somehow never makes contact with the paper. There's nothing much to hold on to, not enough heft in this knob so your hands can feel the extent of very minor movements, no depth to things you can use to anchor a sense of your own solidity.[9]

As game designers, what can we glean from Sudnow's observations? His analysis suggests that there is a wealth of information to be gained about a game's interactivity by looking at it from the player's point of view. One of our disappointments with current writing on games and interactivity is that much analysis occurs not from the point of view of the player, but from the point of view of an outside spectator. This style of over-the-shoulder journalism fails to recognize that interac-

tivity is something to be experienced, rather than observed. In writing a player-centric account of his encounter with the game, Sudnow calls attention to key concepts for designed interaction. Concepts such as directed choice, player control, amplification of input, system representation, and direct, visible feedback emerge in his poetic meditation on perception, attention, cognition, and the body.

Creating a game means designing a structure that will play out in complex and unpredictable ways, a space of possible action that players explore as they take part in your game. What possible actions might players take in the course of a game of Musical Chairs? They might push, shove, tickle, poke, or fight for their seat once the music stops and the mad scramble for chairs begins. The game designer must carefully craft a system of play in which these actions have meaning in support of the play of the game, and do not distract or interrupt its play.

But game designers do not directly design play. They only design the structures and contexts in which play takes place, indirectly shaping the actions of the players. We call the space of future action implied by a game design the *space of possibility*. It is the space of all possible actions that might take place in a game, the space of all possible meanings which can emerge from a game design. The concept of the space of possibility not only bridges the distance between the designed structure and the player experience, but it also combines the key concepts we have presented so far. The space of possibility is *designed* (it is a constructed space, a context), it generates *meaning* (it is the space of all possible meanings), it is a *system* (it is a space implied by the way elements of the system can relate to each other), and it is *interactive* (it is through the interactive functioning of the system that the space is navigated and explored).

The space of possibility springs forth out of the rules and structures created by the game designer. The space of possibility is the field of play where your players will explore and cavort, compete and cooperate, as they travel through the experience of playing your game. But like David Sudnow who wishes he could reach out and touch the electronic blip of his Breakout paddle, as a game designer you can never directly craft the possible space of your game. You only can indirectly construct the space of possibility, through the rules you design. Game design is an act of faith—in your rules, in your players, in your game itself. Will your game create meaningful play? You can never know for sure But understanding key concepts like design, systems, and interactivity can help bring you closer to a meaningful outcome.

Further Reading

Computers as Theater, by Brenda Laurel

Although Laurel is not speaking about games directly, her discussion of a dramatic theory of human-computer activity has many connections to the interactivity of games. The most relevant discussions to game design focus on the mechanics of interaction and the way people interact with machine interfaces

Recommended.

Chapter 1. The Nature of the Beast

Chapter 5 Design Principles for Human-Computer Activity

The Design of Everyday Things, by Donald Norman

Norman's book is a must read for any designer involved in the design of interactive systems. His approach has been formalized more recently within the catch-phrase "experience design," which places the user at the center of any designed activity Although Norman is writing about everyday objects such as telephones and car doors, his observations have direct application to the design of games as interactive systems

Recommended:

Chapter 1 The Psychopathology of Everyday Things

Chapter 2 The Psychology of Everyday Actions

Chapter 3 Knowledge in the Head and in the World

"Designing Interactive Theme Park Rides: Lessons From Disney's Battle for the Buccaneer Gold," by Jesse Schell and Joe Shochet

In this design postmortem of one of Disney's interactive theme park rides, Schell and Shochet discuss the reasons for the ride's success Their analysis is design-driven, and offers insight into the tools, techniques, and psychology used to create an effective and entertaining interactive experience Available at <www gamasutra com>

"Formal Abstract Design Tools," by Doug Church

In making one of the most robust arguments for the development of a common vocabulary for games, Doug Church establishes a precedent for critical thinking within the emerging field of game design "Formal Abstract Design Tools" is written from a game design perspective and explores concrete concepts of interactivity in the design of player experience Available at <www.gamasutra.com>

Pilgrim in the Microworld, by David Sudnow

This first-person account of one man's genuine obsession with the Atari 2600 game Breakout offers a clear portrait of the aesthetics of interactive systems. Concepts related to the anatomy of a choice, discernability and integration of player action, pleasure, and core mechanics are discussed in terms of player experience, making it a valuable resource for those intent on understanding just what is happening from moment-to moment during game play

Recommended:

Memory
Interface
Cathexis
Eyeball
Coin

The Art of Interactive Design: A Euphorious and Illuminating Guide to Building Successful Software, by Chris Crawford

The Art of Interactive Design is a non-technical book about the design of interactivity Crawford uses his experience as a designer of games and interactive systems to discuss how interactivity works For Crawford, interaction is "a cyclic process in which two actors alternatively listen, think, and speak." This conversational model of interaction is used throughout the text to good effect

Recommended:

Part I· Chapters 1–6

Notes

1. <dictionary com>.
2. Stephen W Littlejohn, *Theories of Human Communication,* 3rd edition (Belmont, CA: Wadsworth Publishing Company, 1989), p. 175.
3. Brenda Laurel, *Computers as Theater* (Reading, MA: Addison-Wesley Publishing Company, 1993), p. 112.
4. Andy Cameron, *Dissimulations: Illusions of Interactivity* (MFJ No. 28: Spring 1995), <http.//infotyte.rmit.edu.au/rebecca/html/dissimulations html>
5. Chris Crawford, *Understanding Interactivity* (San Francisco No Starch Press), 2002, p. 6
6. Ibid; p. 7.
7. Doug Church, "Formal Abstract Design Tools." <www.gamasutra.com>, July 16, 1999.
8. Jesper Juul, Computer Games and Digital Textuality Conference at IT University of Copenhagen, March 1–2, 2001
9. David Sudnow, *Pilgrim in a Microworld* (New York: Warner Books, 1983), p. 117.

Interactivity SUMMARY

- **Interactivity** is closely linked to the concepts of design, systems, and meaningful play. When a player interacts with the designed system of a game, meaningful play emerges.
- There are many valid definitions of interactivity. Cutting across all of them are **four modes of interactivity:**

  Mode 1: Cognitive interactivity; or interpretive participation;
  Mode 2: Functional interactivity; or utilitarian participation;
  Mode 3: Explicit interactivity; or participation with designed choices and procedures;
  Mode 4: Beyond-the-object-interactivity or cultural participation.

- These four modes are not distinct categories but are instead overlapping ways of understanding any moment of interactivity. They usually occur simultaneously in any experience of a designed system.
- Not all interaction is **designed interaction.** When an interaction is designed, it has an internal structure and a context that assign meaning to the actions taken.
- An interactive context presents participants with **choices.** Choices can be **micro**-choices of moment-to-moment interactivity or **macro**-choices, which concern the long-term progress of the game experience.
- The basic unit out of which interactive meaning is made is the **action > outcome** unit. These units are the molecules out of which interactive designers (including game designers) create larger structures of designed interaction.
- Within each action > outcome event is a series of five stages that help construct a choice in a game. These stages are expressed through the following questions:

  1. What happened before the player was given the choice?
  2. How is the possibility of choice conveyed to the player?
  3. How did the player make the choice?
  4. What is the result of the choice? How will it affect future choices?
  5. How is the result of the choice conveyed to the player?

- Each of these stages represents either an **internal event,** in which the system of the game processes and receives the choice, or an **external event,** in which the choice is represented to the player.
- The **space of possibility** of a game is the space of all possible actions and meanings that can emerge in the course of the game. This concept ties together meaning, design, systems, and interactivity.

GAMES AS THE PLAY OF EXPERIENCE

interactivity
input/output/internal processes
core mechanic
repetition
second-order design
core mechanic variations

23

I rise with the first shot, no problem, pushing my head up toward the peak of its ascent, and the ball hits the brick. No it doesn't. I wish it struck the barricade, wish it surged forward and surged back, so as I surge along pushing and recoiling there wouldn't be those blank spaces while I wait for the ball to catch up or fall behind. It has a rhythm filled with empty time, while mine is compacted, full and dense....

I'm rising with the shot then, the volume turned up high now, filling the room with bleeps, and I'm putting the shoulders and head into the action, singing a song with this ten-second sequence.... Hum the sixteen-note melody created by the bleeps when the ball hits paddle, bricks, and side wall. ***Bleep****, the serve...****bloop****, the return...****blapbleep****...a quick brick bounce off the side wall down to...****bloop****, the next return after the beat, and then up, down, off the side down up. Throw yourself into the unfolding melody, carry the hand smoothly from one point to the next, ride with the ball through the whole five places.*—**David Sudnow,** Pilgrim in the Microworld

Introducing Experience

To play a game is to *experience* the game: to see, touch, hear, smell, and taste the game; to move the body during play, to feel emotions about the unfolding outcome, to communicate with other players, to alter normal patterns of thinking. Unlike the clean mathematical forms of rules, the experiential play of a game is fuzzy, murky, and messy. Yet it is in this realm that players actually take part in a game, engaging in meaningful play. In ***Games as the Play of Experience,*** we build on the somewhat abstract definition of *play as free movement within a more rigid structure* to look concretely at the ways that games build experiences for players In order to do so, our focus narrows. In the previous chapter, we defined play not just in games, but in the broadest sense of the word. As we move forward, we will limit the scope of our investigation to the play occurring in games.

What does it mean to experience game play? The passage that opens this chapter is from *Pilgrim in the Microworld,* a book that describes, in loving detail, a player's waxing and waning addiction to the video game Breakout. Breakout was one of the earliest video games, first released as an arcade game in 1976 by Atari, and then published for the Atari 2600 home video game system a few years later. In this Pong-like game, a player moves a paddle back and forth across the bottom of the screen, bouncing a ball into rows of bricks positioned along the top of the screen. Each time the ball hits a brick it disappears; the goal of the game is to move through as many screens as possible, clearing every brick on the screen.

Throughout his extraordinary book, author David Sudnow vividly evokes the experience of playing Breakout. His highly personal account describes the complex experience of play with a nuance and insight rarely found in writing about games. In his observations, Sudnow uncovers a flurry of experiential elements: the kinesthetic movement of his body as he plays; his multi-layered emotions of hope and anxiety, his altered sense of time; the visual and audio rhythms of the game; the minute controlling motions of his hand on the paddle; and even a kind of perceptual identification with the ball itself.

In the sensory blur of game play, the formal system of the game only reveals itself through its experiential effects. The programmed code, paddle controller, console hardware, television screen, and audio speakers become elements of a larger system that includes the player himself. The space of possibility for Sudnow is a visceral space of experiential potential, a space he explores through play, his state of being in some way extended though the input, output, and logic of the game.

The experience of play is just that. an experience. The word "experience" commonly refers to:

> 1 The apprehension of an object, thought, or emotion through the senses or mind,
>
> 2. Active participation in events or activities, leading to knowledge or a skill;
>
> 3 An event or a series of events participated in or lived through.[1]

In other words, experience is *participation.* Every game creates its own kind of experience, from the theatrical interventions of live-action role playing, to the international spectacle of the Olympics, to the vast virtual communities of Phantasy Star Online. There is no single, proper kind of experience that all games should try and provide. Yet there are principles of meaningful play that we can apply to games in a variety of design contexts In this chapter, and in the **PLAY** schema that follow, we investigate the design of experience as a fundamental principle of game design.

Qualities of Experience

The experience of play comes in so many diverse forms that creating a single catalog that takes all of them into account would be an impossible task. However, this does not mean that systems for categorizing play cannot be a useful tool for solving design problems. The classification model developed by Roger Caillois, outlined in the previous chapter, provides one typology for the variety of experiences found in games. In *Toys*

as Culture,[2] Brian Sutton-Smith presents another model, one that lists the psychological processes by which games are experienced Although Sutton-Smith is looking specifically at video games, his model is relevant to other kinds of games as well. His five elements of game experience are.

- *Visual scanning.* visual perception, especially scanning the entire screen at once.
- *Auditory discriminations.* listening for game events and signals.
- *Motor responses:* physical actions a player takes with the game controls.
- *Concentration:* intense focus on play
- *Perceptual patterns of learning:* coming to know the structure of the game itself.

Sutton-Smith offers a relatively succinct list of the elements that constitute the experience of play within a digital game. Visual scanning and auditory discrimination represent the sensorial activities of the player, motor responses represent the player's physical actions, and the other two elements (concentration and perceptual patterns of learning) represent cognitive mechanisms internal to the player that link these inputs and outputs How do these categories apply to the experience of a particular game? If we look back at Sudnow's observations of Breakout one more time, we can find examples from all of Sutton-Smith's five categories of experience:

Concentration and auditory discriminations: *"I'm rising with the shot then, the volume turned up high now, filling the room with bleeps, and I'm putting the shoulders and head into the action, singing a song with this ten-second sequence."* Sudnow is deeply engaged in play, to the point where he feels like he is part of the game system. He moves his body in synch with the action on screen, humming along to its blips and bleeps, focusing all movement and energy on control of the ball.

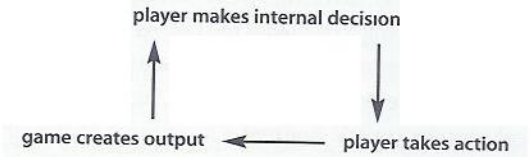
Visual scanning and motor responses: *"Throw yourself into the unfolding melody, carry the hand smoothly from one point to the next, ride with the ball through the whole five places."* Sudnow perceives the screen as a single field of space within which he guides the ball. As his eyes scan the screen he takes action through the game controller, moving the paddle into strategic position Sudnow psychologically integrates the horizontal movement of the virtual paddle onscreen with the physical motion of twisting the game control knob.

Perceptual patterns of learning: *"At first it felt like my eyes told my fingers where to go. But in time I knew the smooth rotating hand motions were assisting the look in turn, eyes and fingers, in a two-way partnership."* The coordination Sudnow achieves between perception and action is a quality of deeply engaging play. His eyes work in concert with his hands to control the action onscreen. The resulting experience of play offers a seamless transition between input and output, between the action and outcome of player choice.

Although Sutton-Smith's five categories do a good job of describing the experience of early, single player console games, they are certainly not inclusive of all games. A game might be invented, for example, that involves smell-based sensory input. There are also plenty of games that involve social communication between players, which Sutton-Smith's model does not take into account.

However, we can abstract elements from Sutton-Smith's thinking that are more widely applicable. His model in essence posits relationships between inputs, outputs, and internal player mechanisms. This three-part model is a useful general structure for understanding how players experience a game. The way that a player perceives a game and takes action in it is always going to be specific to a particular design. But these details are

contained within a larger system of experience that always includes some kind of sensory input, player output, and internal player cognition.



All three components of this model can be considered in isolation, but they only generate meaningful play as part of a larger designed system. What kind of play experience do you want to create? A rhythm-based dance game such as Bust-a-Groove locates player experience within a finely tuned set of visual, auditory, and physical cues designed to involve players within the full-body rhythms of structured beats. A word game such as Scrabble forces players to think strategically and linguistically, scanning the board for openings, rearranging letters in their head and in their hand, making language tactile by manipulating smooth wooden tiles. An arcade shooter such as House of the Dead emphasizes the ability to quickly scan and isolate elements on screen, responding to game events with rapid and repetitive motor responses. Identifying the qualities of play you want your players to experience is a useful way of framing any game design problem.

Designing Interactive Experiences

The challenge, of course, is that the experience of play is not something that a game designer directly creates. Instead, play is an emergent property that arises from the game as a player engages with the system. The game designer creates a set of rules, which players inhabit, explore, and manipulate. It is through inhabiting, exploring, and manipulating the game's formal structure that players experience play. We made this point in earlier chapters, but it is important enough to repeat here within the context of experience. The game designer only *indirectly* designs the player's experience, by *directly* designing the rules.

So how do game designers shape player experience? We have already covered the basics. In the chapter on ***Interactivity,*** we discussed in detail how sequences of action > outcome units in a game add up to a larger system of meaningful play, especially when the outcome is both discernable and integrated into the game as a whole. If we highlight the experiential dimensions of these choice-based mechanisms, we can frame games as systems whose meaning emerges from the experience of players as they make choices in a game. Every component of a choice, from the representational elements displaying actions and related outcomes, to the systemic elements determining the internal logic of a choice's result, are experientially relevant.

Creating great game experiences for players—creating *meaningful* experiences for players—requires understanding how a game's formal system transforms into an experiential one. Doing so means considering both micro- and macro- dimensions, from the small moment-to-moment interactions confronting a player to the way these core interactions combine to form a larger trajectory of experience. Throughout **PLAY,** we cover the many dimensions of the micro- and macro- components of designed game play. The rest of this chapter will take a very close look at the fundamental micro-interactions of a game, known as the core mechanic.

The Core Mechanic

Every game has a *core mechanic.* A core mechanic is the essential play activity players perform again and again in a game. Sometimes, the core mechanic of a game is a single action. In a footrace, for example, the core mechanic is running. In a trivia game, the core mechanic is answering questions. In Donkey Kong, the core mechanic is using a joystick and jump button to maneuver a character on the screen. However, in many games, the core mechanic is a compound activity composed of a suite of actions. In a first-person-shooter game such as Quake, the core mechanic is the set of interrelated actions of moving, aiming, firing, and managing resources such as health, ammo, and

armor. Baseball's core mechanic is composed of a collection of batting, running, catching, and throwing skills. In a real-time strategy game such as Starcraft, the core mechanic combines resource management with wargame strategy and rapid mouse and keyboard command skills.

A game's core mechanic contains the experiential building blocks of player interactivity. It represents the essential moment-to-moment activity of players, something that is repeated over and over throughout a game. During a game, core mechanics create patterns of behavior, which manifest as experience for players. The core mechanic is the essential nugget of game activity, the mechanism through which players make meaningful choices and arrive at a meaningful play experience. It is therefore very important to be able to identify the core mechanic at the beginning of the design process, even if it changes as the game develops. Pinpointing the core mechanic of the game allows designers to generate a summary profile of the game's interactivity. Very often, when a game simply isn't fun to play, it is the core mechanic that is to blame.

The notion of a core mechanic is a crucial game design concept, and one frequently taken for granted in the design process. Concepts for games, particularly digital games, often begin with an idea for a story or character, to take place within an established commercial genre. This is a valid way to start a design process. However, in focusing on the "high level," narrative elements of a game, game designers can miss equally fundamental questions that concern the core mechanic and play experience. Game designers don't just create content for players, they create *activities* for players, patterns of actions enacted by players in the course of game play.

Core Mechanics in Context

Designing the activity of play means creating the system that includes the game's sensory output to the player and the player's ability to make input, as well as guiding the internal cognitive and psychological processes by which a player makes decisions. The core mechanic is not limited to just one component of this experiential process, but exists as an activity that permeates all three. Following are several game examples, each one utilizing an extremely different core mechanic

Tag

In Tag, one player is "It." This player chases all of the other players within a limited boundary; when another player is tagged by "It," he or she becomes "It." The core mechanic of Tag is incredibly simple: chase and be chased. Because Tag is a physical game, the experiential component is very rich. As input, the player senses the entire field of play, the position of other players (especially the player that is "It"), as well as his or her own state of exhaustion. The output involves a player's entire body, and usually involves running, dodging, and other evasive maneuvers.

The simple rules leave no room for ambiguity. If you are not "It," you avoid being tagged at all costs. If you are "It," your goal is to shed this role by giving it to another. Chasing and running. Running and chasing And then, the occasional tag. The repetition of the core mechanic enacted over the course of a game builds into larger patterns of experience as players run about the field, avoiding the player that is "It," exchanging roles of the hunter and the hunted when a tag takes place. As an experienced game system, Tag's mythic simplicity is part of its appeal.

Verbal Tennis

Verbal Tennis is an unusual game in which two players carry on a conversation, taking turns making statements. The only rules are that each statement must be in the form of a question and cannot repeat another statement that has already been made. If a player gets stuck and cannot make a coherent response to the previous statement, he or she loses. A game might begin as follows:

PLAYER 1: Are you feeling well today?

PLAYER 2: Don't I look well?

PLAYER 1: If I knew that, why would I have asked you?

PLAYER 2: Why do you care how I'm feeling?

PLAYER 1: Is it impolite to ask?

PLAYER 2: Can't you figure that out for yourself?

PLAYER 1: What?

PLAYER 2: Didn't you hear what I said?

etc.

The entertaining challenge of verbal tennis is to continue the conversation as a logical chain of statements. Taking part in the conversation, or taking an action in the game, involves a uniquely engaging core mechanic. The player's experiential input and output are simple conversational statements. But the internal process of the player involves complex thinking, in which he or she quickly assimilates the previous statement and composes a new one that extends the conversation, shaping his or her response into a question.

In Verbal Tennis, the actual *activity* of the player is merely to listen and to speak, something that players do in their ordinary lives many times a day. The elegance of the game is that a simple set of rules transform this action into the puzzle-like experience of Verbal Tennis, resulting in an intellectually challenging and theatrically engaging game experience.

LOOP

The game of LOOP is a single-player computer game where the player uses the mouse to draw lines around fluttering butterflies and capture them. Butterflies come in different colors, and a player can only capture groups of butterflies of the same color There are additional ways to score, special bonuses, hazards, and bonus levels, but the core mechanic—looping—remains the same throughout the game.

The core mechanic of a computer or video game involves a hardware input device in some way, and LOOP is no exception. The essential activity of the game is to use the mouse to roll the cursor about the screen, drawing lines to make loops around the moving butterflies. The player perceives visual information on the screen and responds through motor movement, generating additional audio and visual feedback. Instead of a drag-and-click, cursor-style interaction, LOOP engenders a fluid series of wrist and arm gestures. The design of LOOP emphasizes this core activity throughout: if the player clicks during a game, the game pauses; on the game's main menu, the player does not click on a button but instead loops around it to make a selection.

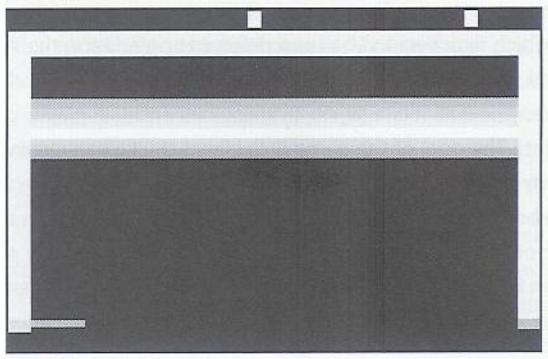
One challenge of designing computer game interactivity lies in inventing new forms of player interaction, new core mechanics that lead to alternative game experiences. Just as Verbal Tennis turns an ordinary conversation into dueling wordplay, LOOP appropriates conventional mouse interaction and twists it to playful effect.

Just because a game's input is limited to mouse and keyboard or console controller input does not mean that it has to rely on the conventions of other games. What if mouse movement was the inverse of cursor movement? What if the keyboard was used as a physical input grid? What if the player had to hold the console controller upside-down? Designing inventive core mechanics, on or off the computer, often comes from questioning existing conventions

Breaking Out of Breakout

*Line up your extended finger with the lower left corner of the TV screen a comfortable six feet away. Now track back and forth several times in line with the bottom border and project a movement of that breadth onto an imagined inch and a half diameter spool in your hands. That's how knob and paddle are geared, a natural correspondence of scale between the body's motions, the equipment, and the environs preserved in the interface. There's that world space over there, this one over there, and we traverse the wired gap with motions that make us nonetheless feel in a balanced extending touch with things.—**David Sudnow,** Pilgrim in the Microworld*

Breakout



This chapter concludes with a detailed look at two digital games, and an examination of how the core mechanic helps create an experience of meaningful play. The first game is Breakout for the Atari 2600, the game David Sudnow details in his book. Breakout's core mechanic is both simple and elegant; it is one of the keys to what makes the play of the game so meaningful. The player uses a paddle controller to move a bar on the bottom of the screen left and right, trying to intercept a "ball" that is bouncing around the game space.

It would be difficult to find a core mechanic more stripped down than in Breakout. In the game, players are not moving an animated character through a richly textured 3D space; they are not even moving in 2D. Players are moving a blocky, rectangular shape in one dimension along a line. Players don't have a range of actions and powers. They don't have a complex set of tasks to complete or resources to manage. All players do is turn the knob, move the line, and avoid missing the ball. Despite this spare interactive scheme, Breakout manages to generate meaningful play.

The simplicity and immediacy of the design creates an interactive circuit between the player and the game. The response of the paddle on the screen to the movements of the knob in the player's hand is intuitive and instantaneous. The screen, the controller, and the player enter into a larger set of experiential relationships, forming a system that bridges the "wired gap," as Sudnow puts it, between the player's world and the televised world of the game. But if that were everything there was to Breakout, a line moving on a screen, it wouldn't be a game. It wouldn't have meaningful play. And it certainly wouldn't generate the obsessive attachment Sudnow documents. On top of this core mechanic, the simple action of knob-turning and ball-blocking, Breakout builds a more complex game experience.

> Of course the lights didn't obey the laws of physics governing solid objects, like billiard balls, say. But Atari had rather decently simulated a sense of solidity The light [ball] came from a certain angle toward the side wall, and then followed out the triangulation by going in the direction you'd predict for a real ball. What about the paddle? Hit on an off-centered portion of a tennis racket or hand, a ball will deflect on a different path and you can thereby place shots Sure enough they'd programmed the trajectories and different parts of the paddle surface to match, so the light-ball behaved rather like a tangible object, refracting and deflecting so it seemed you could at least somewhat control the ball's direction [3]

At first, playing Breakout is simply a matter of hitting the ball, trying not to let it pass by the paddle. If a player misses the ball five times, the game is over. But as play continues, the game

play grows deeper. The paddle is divided into five sections, each of which ricochets the ball at a different angle. Using the simulated physics of the game, players can learn to direct shots. When the ball hits a brick, it disappears and the player gains points. The goal of the game is to direct the ball to remove as many bricks as possible, gaining points along the way. Because the brick patterns at the top of the screen change each time the player hits and removes a brick, the playfield gradually shifts from full to empty as a level progresses, each new arrangement offering different possible trajectories for the ball to follow.

Many patterns and rhythms of play emerge. A skilled player will concentrate on one side of the screen, creating a hole in the wall of bricks that allows the ball to "break out" and bounce back and forth along the top of the screen. Other kinds of strategies are required for the endgame, in which only a few bricks remain: the center of the paddle is used to hit the ball in a nearly vertical trajectory, cutting a slow path across the screen toward the remaining bricks. More than just a simple system of interaction, the game rules create multiple levels of play experience, layering strategic thinking and gradual skill acquisition on top of the physical and perceptual components of the core mechanic.

All of this experiential complexity in such a simple game! Yet the player's action, the essential activity, the core mechanic, remains strikingly spartan: rotate the knob with the wrist. Out of this basic interactivity blossoms an entire structure of play. This is precisely how meaningful play emerges on the level of experience: through player action, input, and output. In the end, the system of play becomes more than the sum of its parts

Variations on a Core Mechanic

Working with an existing core mechanic is a common game design problem. Perhaps there is a core mechanic that you want to borrow. Or maybe a publisher is funding a digital game project that needs to resemble an existing game genre. Or it could be that you have already designed an original core mechanic, but you don't know how to extend it into a full game experience. In this section, we look at examples of how to modify and re-mix a core mechanic to create new game experiences, using Breakout as a touchstone. The version of the game Sudnow describes is Breakout for the Atari 2600. Although he only plays the "basic" version of the game, the original Atari cartridge includes many play variations.

The inclusion of game variations was a common design strategy in early console games for platforms such as the Atari 2600. Typically, designers extended the basic game interaction, creating numerous variations for play. For this reason, Atari games are excellent examples of game designs that take a core mechanic and spin out many variants. The alternate versions can be clever and engaging or gratuitous and unplayable. But there is much to learn from both successful and unsuccessful attempts at creating core mechanic variations. On the original Atari 2600 Breakout cartridge, there are twelve different game variations. We list the mechanics for each below:

Timed Play

Breakout on the Atari 2600 is a finite game. The goal is to clear the bricks from one screen, which leads to a second screen of bricks If that screen is cleared, the game ends. Because players score points for each brick eliminated, the score at the end of a finished game is always the same (864 points). One problem with this game design is that an expert player will be able to clear both screens and will eventually lose interest in the game. Even though the core mechanic might be engaging enough to encourage repeat play, it is more likely that the player will feel as if the game has been "solved." The game's space of possibility will become too familiar, and is unlikely to offer any more surprising challenges.

To address this potential problem, the cartridge includes a "timed" version of the game. In addition to a point score, the game keeps track of how long a player has been playing. The goal of a timed game becomes not only reaching the maximum number of points, but doing so as quickly as

possible, adding a quantifiable tool for judging performance to the same essential game play. The result is that timed Breakout becomes a more engaging game for advanced players, who may have reached a scoring ceiling in terms of points. The game variation allows players to continue exploring strategies for reducing their overall time.

It is significant to note that the timer could have been included in the basic game as well. The timer doesn't structurally change the actual interaction—it merely displays a new kind of data. But the timer does change the experience of the game, psychologically placing players under more pressure as the seconds tick by. Breakout can be a very difficult game for beginners, and it was a smart design decision to keep the timer element out of the basic game. That way, beginners feel a bit more comfortable as they learn the game's basic interaction. Conversely, advanced players feel as if they have "graduated" to a new level when they take up the timed version of the game.

Breakthru

Another variant on the Breakout core mechanic is the "Breakthru" version. In this game, the player's core interaction with the paddle remains the same, but the behavior of the elements in the game change. When the ball hits a brick, it eliminates the brick—but instead of bouncing back, the ball keeps on going until it hits a wall. That means that a ball will travel right through the wall of colored bricks, leaving a trail of empty brick spots as it plows through them.

What is the reason for this design variation? In the normal version of Breakout, it feels satisfying to eliminate bricks, a satisfaction that extends over the course of the game. One by one, brick by brick, you chip away at the wall. Breakthru accelerates this satisfaction, allowing you not just to nip at the wall, but to gouge out whole sections in a single gesture. Although it makes the game much easier, this variation adds a new degree of experiential pleasure to the game. It is significant that the designers chose the more delayed gratification of the basic version to be the default structure for play.

Steering, Catching, and Invisible Bricks

Atari 2600 Breakout includes other variations as well. In some, the player can use the paddle to affect the ball while it is in the air, nudging its path to the left or right. In others, the player uses a button on the paddle to "catch" the ball, making it stick to the paddle until it is released. In a third variation, the bricks are invisible until they are hit, at which point all of the remaining bricks light up.

Each of these versions of Breakout has a strong impact on the play of the game. Steering and catching give the player an additional way to control the ball, increasing the complexity of the interaction slightly, while also decreasing the game's overall level of difficulty. The invisible brick variations make the game much harder, especially when there are only a few bricks left and players must use their memory to aim at them.

All of these variations (timer, breakthru, steering, catching, and invisible bricks) offer not only individual variants, but are mixed and matched to provide many versions of Breakout. Each of the dozen games on the cartridge is either basic Breakout, timed Breakout, or Breakthru; each of these three general types manifests four times: with no additional modifications, steerable balls, catchable balls, or invisible bricks. This system offers a total of twelve different Breakout games, eleven variants on the basic version, each one modifying the game's core game mechanic. Obviously, one effect of including variations is to greatly expand the overall space of play; each version of the game provides new strategic and experiential possibilities. Playing Breakout takes place on two levels: not only do players explore the structure of an individual variant, but they also explore the larger set of variants as a whole.

For example, perhaps you like the satisfaction of the Breakthru version of the game, but you find it too easy. You might balance the difficulty by playing Breakthru with invisible bricks. If you are a strategic player that enjoys the pressure of the clock, timed versions of the game with steerable or catchable balls might work well for you. Providing variations for players lets them design their own experiences in a limited way. Although it is not the right solution for every game, it is certainly part of the appeal of many Atari 2600 cartridges. In the case of Breakout, the variations offer a great lesson in altering a core mechanic in order to enlarge the space of possibility.

Beyond the original Breakout arcade game and the Atari 2600 version of Breakout, there are many other versions of the game that borrow the same core mechanic. For example, the sequel release, Super Breakout for the Atari 2600, refines the play in many ways. In Super Breakout, games are no longer limited to two walls of bricks, but can continue on indefinitely. Super Breakout also adds new game variants, such as more than one ball in play at once, more than one paddle on the screen at the same time, bricks that slowly move downward toward the player, and a special "children's version," in which the ball moves more slowly. The number of variations that could be designed for the core mechanic of Breakout is nearly infinite.

For a last look at Breakout, we turn to Alleyway, a game published in 1989 for the Nintendo Game Boy. The essentials of the game are the same as in the Atari 2600 version. the player uses the directional pad on the Game Boy to move a paddle back and forth at the bottom of the screen, bouncing the ball into a wall of bricks to make them disappear. Alleyway offers its own variation on the game, while still remaining true to the Breakout core mechanic.

Breaking Out

The moment in Breakout when the ball actually "breaks out," when a player carves a narrow path that allows the ball to bounce along the top of the screen, is one of the experiential climaxes of the game. When breakout happens, the ball goes into a brick-clearing frenzy, as the player sits back and watches the system do the work. In the Atari 2600 game, breakout is difficult to achieve, meaning that only advanced players get to experience its thrill. Sometimes, by the time a player hits the top of the screen, there are only scattered bricks remaining, so that the satisfying rapid-fire breakout bouncing never occurs.

Alleyway addresses this design challenge by providing levels that encourage breakouts to occur. For example, the very first level of the game features the classic wall of bricks, but with columns of bricks removed from the left and right sides of the brick wall. Instead of a closed wall that stretches the length of the screen, the wall of bricks has open sides. A well-placed ball can angle into this gap, travel to the top of the screen, and achieve breakout. This brick arrangement makes it much more likely for breakout to occur early in the game.

Furthermore, when breakout happens, the audio design of the game highlights the event for the player. As in the original Breakout, when the ball hits a wall or brick, there is a collision sound effect. In Alleyway, the top border of the screen makes a very different, high-pitched bell-like sound when the ball hits it. This means that when the ball breaks out, the speedy back-and-forth bouncing produces an appropriately celebratory "ding! ding! ding!"

The first variation on the design—removing the sides of the brick pattern from the initial game level—changes the game's structural logic in order to make the satisfying breakout experience more likely. The audio feedback helps emphasize this event when it does occur.

Repetitive Play

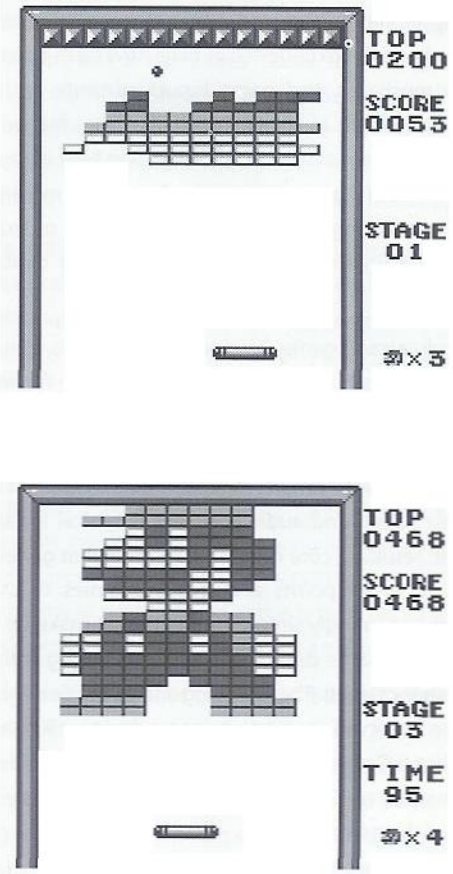
One common criticism of early digital games like Breakout is that they are too repetitive. Although the core mechanic of the game is quite satisfying on its own, each level is essentially identical. There might be many variations of the core game in Breakout and Super Breakout, but once a player has selected a version of the game to play, each set of bricks will be the same from screen to screen.

Alleyway's solution to this design problem was to design many different level variations, so that each time a player clears a level and gets a new wall of bricks, the arrangement (and sometimes behavior) of the bricks is different. Alleyway is certainly not the first title to create unique levels for a Breakout-style game, but the progression of levels is particularly well-designed.

Some levels in Alleyway feature bricks that fly steadily across the screen from right to left. Others have bricks that slowly move down the screen toward the player's paddle. In the timed bonus levels, the walls are replaced by portraits of Nintendo characters made out of bricks that the player must eliminate, breakthru style: the ball passes straight through the bricks and only bounces back when it hits a wall.

The levels in Alleyway follow a repeating pattern. For each structural arrangement of bricks (such as the open-sided wall of the first level), the player plays a "standard" version of the game, then a version with horizontally moving bricks, then vertically moving bricks, before reaching a bonus level. The next level introduces a new structural arrangement, and the player cycles through the set of variations again, followed by another bonus level. This pattern of levels creates a wonderfully heterogeneous playing experience, providing both familiarity (the variations cycle in a consistent way) and newness (every four levels, a new structure appears). The engaging, repeatable core mechanic of Breakout is enhanced through a system of levels that adds an element of discovery to the overall experience.

Alleyway



Adjustments to a core mechanic, whether in a digital or non-digital game, can be subtle or overt They can create meaningful variations on an existing game, or a new game altogether. The key to taking a core mechanic and modifying it within a game relies on an iterative process. As you experiment with variations, ask yourself what is successful or unsuccessful about the existing core mechanic. Then try out your best guesses to see whether or not adjustments to the core mechanic result in more meaningful play.

Putting It All Together

This chapter has introduced some general frameworks for thinking about the experience of play: how rules become play, the core mechanic, and game inputs, outputs, and internal player mechanisms. In the **PLAY** schemas that follow, we take more specific approaches to understanding how a player occupies the space of a game during play. But before moving on, we would like to bring our ideas about the play of experience together in a final, detailed look at a particular digital game: Centipede

In the early arcade game Centipede, the player's input occurs though a trackball device and a single button for firing. The player uses the trackball to move a bug-like character on the screen, firing shots upward at a variety of objects. Player input in Centipede is very simple: move and fire. Output, in the form of a video screen and audio speakers, is typical for an arcade game. The resulting core mechanic is somewhat generic: shoot enemies to score points and avoid enemies to stay alive. Despite the seemingly simple elements that make up the core mechanic, the game design of Centipede engages the player on a number of levels. The following analysis of Centipede relies heavily on observations made by game designer Richard Rouse III in his book *Game Design: Theory and Practice*.[4] He devotes an entire chapter to Centipede, providing a rigorously detailed reading of the game's design.

How does a player take action in Centipede? There are some wonderful restrictions designed into the game. The trackball itself was a novelty when Centipede was first released, and even today, the large ball promises tactile, fluid motion. Ironically, however, the player cannot move the character anywhere: movement is restricted to the bottom 20 percent of the screen. By limiting the character in this way, the game retains a tight structural focus. As in games such as Space Invaders and Breakout (other games where the player moves along the bottom of the screen), game objects occupy the rest of the space above the player In Centipede, this space contains both inert obstacles like Breakout bricks, as well as descending enemies like the aliens of Space Invaders. Even though movement is limited, the fact that the player can maneuver a little bit in the vertical dimension increases strategic opportunities and gives the player a much greater sense of freedom than in games that limit movement to a single spatial dimension. Yet the freedom of movement is just enough: if the player was given access to the entire screen, the game enemies and obstacles (which are focused downward towards the player's narrow strip of free action), would not function as successfully.

Centipede's shooting mechanism also places important restrictions on player action. The player can hold down the fire button for a continuous stream of shooting, but only one shot can appear on the screen at a time. Because objects can be very close to the player or very far away, timing shots becomes a focus of game play. Sometimes, a stream of rapid, short-range shots are necessary. However, a shot that goes all the way up to the top of the screen can waste a maddening amount of time, as a player impatiently waits to gain the ability to fire again. The result of this simple design decision (only one shot on the screen at once) forces players to manage their shots like a resource, greatly enriching the decision-making process of the player.

What distinguishes Centipede's well-designed play from a more generic 2D shooter is what Rouse calls the "interconnectedness" of the elements that appear in the game. There are five basic game elements, apart from the player's unit:

- *Mushrooms* are immobile objects that clutter up the screen. It takes four shots from the player to destroy a mushroom, each shot taking away a quarter of the mushroom.
- *Centipedes* are multi-segmented creatures that descend from the top of the screen and move back and forth, descending toward the player. When a centipede hits a mushroom, it drops a row downward, toward the player, meaning that the more mushrooms there are onscreen, the more quickly the centipede will descend. If a centipede

segment is shot, it turns into a mushroom, creating a game play loop in which the player is constantly trying to clear mushrooms from the screen in order to slow the centipede's descent, but is also creating more mushrooms by shooting the centipede. When a player shoots a segment of a centipede that is not the head or tail, the centipede splits into two creatures, becoming a multiple threat.

- *Fleas* descend in a straight line from the top of the screen, leaving behind a dense column of mushrooms in their wake Fleas only appear when the number of mushrooms in the lower half of the screen is below a certain amount, ensuring that there will always be enough mushrooms to create a challenging playfield.
- *Spiders* move in a zig-zag style near the bottom of the screen, directly threatening the player's unit. But spiders eat mushrooms, so the player always has to decide whether it is better to kill a spider right away or to let it eat mushrooms while risking a collision with it.
- *Scorpions* cross the screen horizontally above the player, so they do not pose a direct threat. However, they poison any mushrooms they encounter. If a centipede hits a poisoned mushroom, it will immediately move directly downward toward the player. As a result it is best to remove poisoned mushrooms from the screen.

Each of the five elements plays a role in the game's tightly designed system. The experience of play, a composite of all of the decisions made by the player, emerges from the possibilities mapped out by this system. For example, it is best to keep the overall number of mushrooms low, because the more mushrooms that are on the screen, the more rapidly a centipede will descend and the more mushrooms a scorpion is likely to poison The mushrooms at the top of the screen are particularly difficult to reach, because they are blocked by lower mushrooms, and the limitation on the player's rate of fire makes it difficult to rid the screen quickly of mushrooms that are far away. It is easier to clear mushrooms from the bottom of the screen, but if the player clears too many, a flea will descend, dropping mushrooms across the entire height of the screen, including the top, where they are difficult to clear. The player must carefully prune mushrooms from the field of play, while retaining just enough to keep the flea from appearing.

As Rouse writes, "...each of the creatures in the game has a special, unique relationship to the mushrooms. It is the interplay of these relationships that creates the challenge for the player."[5] He cites many examples of this interplay:

> If the player kills the centipede too close to the top of the screen, it will leave a clump of mushrooms which are difficult to destroy at such a distance and which will cause future centipedes to reach the bottom of the screen at a greater speed However, if the player waits until the centipede is at the bottom of the screen, the centipede is more likely to kill the player With the mushrooms almost functioning as puzzle pieces, Centipede becomes something of a hybrid between an arcade shooter and a real-time puzzle game[6]

In looking at the system of Centipede, it is striking to see how a simple set of rules generates complex play. More than just a complex formal system, such rules ramify into a particular *experience,* a set of relationships that give the player's actions meaning. Shoot this mushroom or that one? Kill the centipede at the top of the screen or the bottom? Let the spider eat mushrooms or not? Furthermore, Centipede is an *action* game: all of this rich decision making happens in an extremely compressed space of time, resulting in the blend of action-shooter and strategy-puzzle experience Rouse describes.

But there's more. In his explication of the game, Rouse goes on to describe not just the basic relationships between game elements, but also how they create what he calls "escalating tension" over time. Centipede's design carefully orchestrates the experience of play, creating tension across many levels of the game at once. For example, there is an immediate sense of tension created through the way that the flea and the centipede respond to being hit:

- The first time the flea is shot, it will accelerate its descent, only being destroyed by a second shot.
- Hitting a central segment of the centipede creates two centipedes.

In both of these cases, the result of a shot helps the player by bringing an enemy closer to destruction, but also adds additional danger to the game. As the centipede descends toward the bottom of the screen, anxiety slowly builds up. If the centipede reaches the bottom, extra centipede heads appear, making things dangerously crowded However, once a level is complete, the player gains a brief respite before the next level begins, a relief that only accentuates the escalating tension that will immediately follow.

Tension also escalates across an entire game. As the game proceeds, more and more mushrooms crowd the game space, until the top of the screen is quite dense with them. Of course, this makes the game more difficult in several ways. Additionally, the creatures become more challenging as the game wears on: the centipede moves faster and eventually begins a level already split into several independent pieces; the spider travels more quickly and in a tighter pattern, making it more difficult to kill. Centipede creates overlapping rhythms of pressure and relief, frustration and achievement, whether in a single game moment, on an individual game level, or across the game as a whole. *This is play: the experience of rules set in motion.* Players *experience* this system: as blinking pixels on a screen, as sharp electronic sounds from a speaker, as sweaty fingers on a trackball and button, as lightning-fast strategic planning. Play culminates in a whirl of perceptions and emotions, thoughts and reflexes, inside the mind and through the body of the player.

Too often, game designers forget that they are creating, above all, an experience of play. It is not enough to tell a story. It is not enough to create pretty pictures or use dazzling technology. A game designer creates an interactive system, a set of choices, an *activity.* When you are making a game, ask yourself fundamental questions: What is the player *actually* doing from moment to moment in the game? How are these moments connected in a larger trajectory of experience? How does the experience of play become meaningful? What, above all, is the play of the game? Although there are no easy answers to these questions, focusing on the play of a game's core mechanic is a good starting point for designing powerful player experiences.

Further Reading

"Formal Abstract Design Tools," by Doug Church *(see page 68)*

Man, Play, and Games, by Roger Caillois *(see page 82)*

Recommended:

I The Definition of Play

II The Classification of Games

Pilgrim in the Microworld, by David Sudnow *(see page 68)*

Recommended.

Memory

Interface

Cathexis

Eyeball

Coin

Notes

1. *American Heritage Dictionary* (Boston. Houghton Mifflin, 2000).
2. Brian Sutton-Smith, *Toys as Culture* (New York: Gardner Press, 1986), p. 69–72
3. David Sudnow, *Pilgrim in the Microworld* (New York: Warner Books, 1983), p. 37
4. Richard Rouse III, *Game Design: Theory and Practice* (Plano, TX: Wordware Publishing, 2001), p. 68
5. Ibid. p 68.
6. Ibid. p 68.

Games as the Play of Experience SUMMARY

- Play *is* experienced through **participation.** When a player interacts with a game, the formal system is manifest through experiential effects.
- Sutton-Smith's model for the psychological processes by which video games are experienced:
  - **Concentration**
  - **Visual scanning**
  - **Auditory discriminations**
  - **Motor responses**
  - **Perceptual patterns of learning**
- This model can be abstracted into three components that constitute the system of experience of any game:
  - **input** by which a player takes action
  - **output** of the system to the player
  - **internal processes** by which a player makes decisions
- Game design is a **second-order** design problem. A game designer only *indirectly* designs the player's experience, by *directly* designing the rules. Creating meaningful experiences means understanding the ways a game's formal system transforms into an experiential one.
- The **core mechanic** of a game is the essential moment-to-moment activity players enact. A core mechanic is repeated over and over in the course of a game to create larger patterns of experience.
- A core mechanic can be a single activity, such as running in a footrace. A core mechanic can also be a compound activity, such as the military tactics, resource management, and mouse and keyboard skills of a real-time strategy game.

Too often, game designers do not consider a game design on the level of the core mechanic, instead relying on conventional interactivity to determine the key player activity.

- A core mechanic can be extended and enlarged through the design of variations. Breakout provides a good example of a simple core mechanic that is intrinsically successful, but which has been successfully modified into many variations.