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## Tempest

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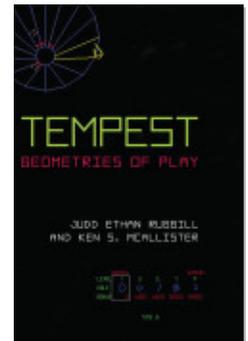
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## CHAPTER I

# Reading *Tempest*

One of our principal goals in this book is to “read” *Tempest*, that is, to describe and analyze the game’s audiovisual iconography and the meanings this iconography evokes. When literary scholars perform this kind of work, they generally follow a set of interpretive conventions designed to reveal both the structure and nuance of the material at hand. So-called close readings involve treating a given literary text strictly within the confines of that work’s language, syntax, and grammar. According to this framework, the author’s intentions, the historical context of the literary work, the political implications of the piece in later ages, and other such interpretive interventions are disallowed; in close reading, the meaning of the piece qua literature is all that matters. In contrast, the reading method known as “new historicism” is founded on the principle that literary works cannot be understood without understanding their broader contexts. Thus, a new historicist reading would not only carefully examine the exact language of a short story but might also try to situate that story within the zeitgeist of the time in which it was composed, recognizing analogies that connect the story to contemporary current events, for example, or identifying thematic patterns linking the story under analysis and other stories written in the same time and place.

While new historicism, close reading (often called “new criticism”), and the numerous other interpretive methods used to analyze conventional literary works have much to offer, their advantages often break down when these methods are applied to “texts” they were never designed to explicate. This is not to say that such conventional analytical techniques ought not to be applied to meaning-making materials other than novels and poems—

say, to *manbwa*, web advertisements, or industrial films—but rather that doing so necessarily limits what can be revealed about such exoteric texts.

The challenge of reading these newer texts is perhaps nowhere so deeply felt as when traditional analytical frameworks are applied to “emerging media,” that is, expressive forms such as interactive fiction, digital poetry, and alternate reality games. Unsurprisingly, due to their inherent multi-medial and multi-experiential qualities, video games are among the most complex “texts” that scholars analyze today. In addition to such literary commonplaces as plot, dialogue, setting, characterization, and so on, video games often invoke a flood of interconnected media forms, styles, and genres, from still photography, chiaroscuro, lens flares, and stop-motion animation, to genre forms such as westerns, noir, and horror, to play styles that include platforming, racing, shooting, and puzzle-solving. Realistically, given this diversity of integrated interpretive stock, there is no definitive method for analyzing video games. What the field of game studies is gradually realizing, in fact, is that video games, like many other forms of old and new entertainment media, need to be explicated in a variety of ways and with the operative presumption that such analyses are cumulative and complementary—even when they contradict one another.

This has certainly been our operative presumption as we have written this book. We need to say a few words about our epistemology and methodology, therefore, before embarking on a close reading of *Tempest*'s aesthetics, technologies, play spaces, literary features, and design ideologies. Our approach in this chapter is rooted in the textual analysis practices of literary-influenced media and cultural studies. In keeping with these practices, we hold the formal qualities of the game as both nucleus and touchstone in our study, building out from the palpable to the ideological, and from the textual to the intertextual. However, we also complement our textual analysis with a contextual one, drawing from the fields of history, political economy, and rhetoric to articulate and extrapolate the iconographies and implications of the formal analysis. Our goal is to provide a focused interdisciplinary examination, a study rich in diversity and nuance but also one with an obvious and tangible through-line. And to be sure, we want always for the landmark qualities of *Tempest* to be in the foreground.

With this approach acknowledged, we now offer some basic background on the game. We then provide a thick description and explication of *Tempest*'s audiovisual, technological, and ludic design, and conclude with an analysis of this design itself.

## Background

*Tempest*—called *Aliens (Vector)* and *Vortex* in pre-production—was developed by Atari Incorporated in 1980–1981 and released in October of 1981. Dave Theurer (pronounced “TOY-er”) designed and programmed the game (including all of the in-game art and audio), Morgan Hoff was the project leader, Sam Lee was the hardware engineer, Doug Snyder was the development technician, Mike Albaugh handled the mathbox microcode, and Dan Pliskin designed the mathbox hardware.<sup>1</sup> It was programmed in 6502 assembly language with structured macros, and according to Theurer, was iteratively debugged on paper printouts, given to typists to make the corrections on a DEC PDP-11/20 system, recompiled and linked for running on a custom-built arcade machine hardware emulator, then debugged again using a paper printout of the code (Theurer 1995; Margolin 2001a).

Originally, the game was meant to be a first-person version of *Space Invaders* (1978), but when the prototype failed to become popular among Atari staff—purportedly the standard first round of market testing at the company at that time—Theurer moved on to an idea based on a nightmare he had several times: monsters are crawling out of a hole in the ground to kill him. In the initial design of the game, the player moved the playfield (in effect, a tubular “hole”) around a canon of sorts, but this proved to be too resource intensive for extant hardware and too nausea inducing for players. Theurer then opted to make the playfield static and the canon mobile. This new design became enormously popular with the Atari staff, and the game was soon green-lighted for full production.

In its heyday, *Tempest* was among the most popular and profitable arcade games in the world (see below for details about its global reach); collectors’ websites report that approximately twenty-nine thousand *Tempest* units were produced, twenty thousand of which were sold to distributors pre-release. Of these, 25,112 were in the upright form factor, 1,663 were cocktail (table-top/two-player) cabinets, and 2,176 were cabaret (smaller and more compact upright) machines.<sup>2</sup>

Both cocktail and cabaret versions of the machine were released a few months after the upright version, in December of 1981. According to an internal marketing research document for Atari’s Coin Operated Games Division, *Tempest* was listed twelve times among the top five earning games for the period between October 1981 and September 1982, trailing only *Donkey Kong* (1981), *Pac-Man* (1980), *Ms. Pac-Man* (1981), and *Turbo* (1981),



Fig. 1. Different arcade machine form factors

and outstripping other arcade classics such as *Defender* (1980), *Centipede* (1981), *Robotron 2084* (1982), *Galaga* (1981), *Frogger* (1981), and *Tron* (1982) (Martinez, 1983).<sup>3</sup> Such popularity meant significant money for Atari and certainly contributed to the company's meteoric rise at the time. Given that Atari promotional materials for the machine indicate that the upright cabinet retailed for \$2,295, the cocktail cabinet for \$2,095, and the cabaret version for \$2,195, the gross revenue generated by *Tempest* machine sales alone (i.e., not including play revenue) after its 1981 release were in the neighborhood of \$66 million (Kraemer 2005).

To our knowledge, no data exists about the game's resale revenues, but given its continued popularity, these monies may well match or even exceed the release revenues. As of late 2012, the *Killer List of Video Games* (KLOV)—an online database maintained by the International Arcade Museum and the Vintage Arcade Preservation Society—lists *Tempest* as the second most-collected arcade machine, exceeded only by *Ms. Pac-Man*.<sup>4</sup> Part of this collectability and continuing popularity is due to the game's source code having been made publicly available in the late 1990s. As a result, in 1999, Josh McCormick started the "Tempest Code Project," an initiative to document every single line of the game's source code.<sup>5</sup> While still not complete as of this writing, McCormick's effort has resulted in numerous hacks, most of which are now played on desktop computers running arcade machine emulation software rather than on the original hardware itself. Duncan Brown's 1982 *Tempest Tubes* and Clay Cowgill's 1999 *Tempest Multigame* are notable examples of such hacks, the latter of which included the two prototype versions of the game developed by Theurer, as well as *Tempest Tubes*, all three authorized revisions of the original *Tempest* code, and an original vector-based *Breakout*-like game.<sup>6</sup> In addition, the game has been ported to a number of home consoles and computers (e.g., Atari ST and Jaguar, Sega Saturn, PlayStation, Xbox 360), redone as a free Java game on the web, and had at least two sequels made—*Tempest 2000* (1994) and *Tempest 3000* (2000)—none of which approached the popularity or critical acclaim attained by the original. Finally, there are also a number of homages to the game, the most popular of which is likely Jeff Minter and Ivan Zorzin's Xbox 360 title *Space Giraffe*.<sup>7</sup>

*Tempest* has also figured prominently in popular culture, having appeared in music videos ("Subdivisions" by Rush in 1982), movies (*Night of the Comet*, 1984), television shows (*American Dad*, 2007; *The Simpsons*, 2006), and received some media attention in the rock music scene for being musician Dave Grohl's (Nirvana, Foo Fighters) favorite arcade game

(“Dave Grohl and Atari *Tempest*,” n.d.). In one of the more bizarre cultural turns of the game, *Tempest* became the basis for a well-circulated urban legend in which Theurer’s original game design—the tube rotates instead of the cannon—had been turned into a game called *Polybius*.<sup>8</sup> Depending on the version of the story, which began circulating sometime in the early 2000s, *Polybius* was part of a government experiment conducted in one or more arcades in the suburbs of Portland, Oregon. Developed by a company called “Sinnesloschen,” German for “sense deletion,” *Polybius* had the power to erase memories, give nightmares, cause nausea, turn itself on, and make players permanently averse to playing arcade games. It supposedly existed in arcades for only a few months, and at random times its coin boxes would be emptied by men in black suits who also collected mysterious data from the machine itself. There are now a number of websites devoted to tracking the *Polybius* urban legend, and several people have worked on actually developing the game and its cabinet art based on the various stories about it. The fact that *Tempest* is almost always deployed as part of the retelling of this popular legend is yet another example of *Tempest*’s captivating and long-lived suggestive powers.<sup>9</sup>

Clearly, *Tempest*’s cultural reach has been and remains considerable. Like most iconic artifacts that come to signify (or are made to signify) a particular moment in history, *Tempest* left a permanent mark on popular cultures the world over despite having a relatively brief moment in the spotlight. By 1983, Atari had already designed and released a *Tempest*-cabinet conversion that allowed machine owners to recycle all but a few of the game’s parts, add a few new ones, and change the cabinet art to become a brand new game: *Major Havoc* (1983), designed by Atari designer/programmer Owen Rubin (*Skydiver* [1978], *Battlezone* [1980], *Tunnel Hunt* [1982]). But while *Tempest*’s superstar status faded in the ceaseless blitz of novelty that characterizes the consumer electronics industry, it had been burnished onto the minds—and hands—of countless arcade goers as one of the medium’s greats. In the next sections we detail the game’s play, aesthetics, and innovations, if not to capture a bit of the game’s magic, then at least to sufficiently describe the ingredients and processes so important to *Tempest*’s alchemy.

### Getting Started

After being powered on and running through a brief diagnostic routine, the *Tempest* machine enters “attract mode,” that is, the mode the machine idles in while not being played and after its diagnostic self-test has been

completed. In this state, the game cycles through three images on its display: a twelve-second high score/copyright screen, an Atari *Tempest* logo display with play credit and price information, and a gameplay action sequence along with the words “PRESS START” or “INSERT COINS.”<sup>10</sup>

When the coin drop is activated—by quarters in the United States, but the machine could also be outfitted with coin mechanisms for other currencies—and the player spins the control-panel knob, the machine exits attract mode and enters “Ready-to-Play Mode.”<sup>11</sup> In this mode, the player has ten seconds to rotate the control-panel knob to select a starting skill level from “NOVICE” to “EXPERT”; these skill levels correspond to tubes/holes/levels in the game: the higher the level number, the more difficult the gameplay.<sup>12</sup> In addition to the text-based skill indicators, the screen also displays the shape of the corresponding tube and bonus value for completing it (we discuss the importance of this feature below). Once the player has inserted sufficient coinage, selected a skill level, and pressed the fire button (or run out of time), “Play Mode” begins.

#### Play Mode Aesthetics

*Tempest* is a vector-based, three-dimensional shooting game in which the action takes place on and is confined to a series of geometrical tubes.<sup>13</sup> In simple terms, this means that the play screen is comprised of a series of lines defined by x-y-z coordinates and across which the player navigates and fires. In its most basic form, *Tempest*'s vector/playfield looks like a sheet of ruled paper held parallel to the ground with the lines running toward a vanishing point.<sup>14</sup> At all times during play, the following interface elements



Fig. 2. Play screen

are at the top of the screen: at the far left, the number of “shooters” (the player’s avatar) remaining, represented as miniature yellow versions of the full size shooter (i.e., two small shooters means two play chances left); at left-center, the player’s score in a large green sans serif/digital typeface; at center, in smaller green type, the current high score and the initials of the player who logged it; and below the high score in blue is the current player’s level.

Each of *Tempest’s* tubes is rendered in one-point linear perspective and consists of sixteen line segments or “rails” that emerge near the vanishing point and run along the z-axis toward the player, effecting a sense of depth and three-dimensionality. Both the near and far ends of the rails are capped and connected by line segments, which serve to delimit the shape of the tubes and give the appearance of “looking into a well” (Atari 1981c, 15). There are sixteen different tube shapes, and the set is repeated in different colors and increasing difficulty levels over the course of the game’s ninety-nine levels (levels 1–16 are rendered in blue; 17–32 in red; 33–48 in yellow; 49–64 in cyan; 65–80 are invisible [i.e., rendered in black on a black background]; and 81–99 are green). Regardless of tube color, individual rails and indeed the entirety of the tube itself can temporarily change color due to in-game events, such as the repositioning of the shooter, the deployment of a specific weapon (e.g., the Superzapper), the earning of an additional shooter, or the activity of the game’s enemies (e.g., Pulsars).<sup>15</sup> The transition from one tube to the next (i.e., a level change) occurs when the player has destroyed all of a level’s enemies.<sup>16</sup> In this transition, the shooter is rocketed down the tube into the vanishing point, which is replaced by a star field through which play is transitioned to the near end of the next tube.

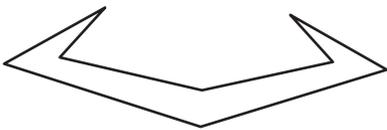


Fig. 3. Shooter

The shooter is a yellow, simple, non-convex, eight-sided polygon or “claw-like” avatar that straddles adjacent rails and which the player controls via a plastic dial (officially, “the control-panel knob,” and commonly,

“the spinner”) connected to the game’s encoder-wheel (Atari 1981c, 15). The control-panel knob (and thus the shooter) is capable of rapid, bidirectional rotation, though the shooter’s movement is confined to the near rim of the tube, as if on a rail. In closed tubes (such as the first, a circle), the shooter can move endlessly in either direction around the rim, both

reifying and belying the concrete limitations of the playfield. In open tubes (such as tube nine, a V-shape), by contrast, the endless spin and its associated freedoms are curtailed by the finite ends of the playfield, which influence both navigational possibilities and play strategies. The shooter can produce up to eight shots at a time on-screen, each of which is capable of destroying a single enemy—except for the game’s “spikes,” which we discuss in detail below. The shooter’s shots disappear upon enemy contact or when they reach the far rim of the tube.

In addition to the shooter, the player is also able to deploy the Superzapper, an invisible weapon that illuminates the tubes’ rails when activated and whose initial use destroys all on-screen threats simultaneously except for spikes and enemy shots. Superzapper use, however, is limited to twice per tube, and the second deployment only destroys a single random enemy from among the various on-screen threats.<sup>17</sup> The Superzapper is fully recharged in the transition between tubes.<sup>18</sup>

*Tempest* contains five types of enemies that the player must confront over the course of the game: Flippers, Tankers, Spikers, Fuseballs, and Pulsars. All of the enemies emerge from the vanishing point of the tube, destroy the shooter on contact, and, with the exception of Fuseballs, are capable of firing destructive bursts toward the near rim down the gutter they occupy. These bursts disappear if they touch the player’s shooter, a shooter’s shot, or the rim of the tube. Again, all enemies can be destroyed by the shooter or by a superzap, save the spikes—intra-gutter lines of various lengths—the Spikers leave behind. Spikes can only be destroyed piecemeal by the shooter’s shots. Finally, like the tubes, the color of the enemies changes over the course of the game. Enemy shape, movement, and ability are as follows:

#### Flippers

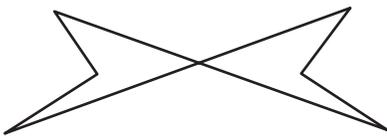


Fig. 4. Flipper

Flippers are crossed quadrilaterals with chevron-shaped ends. They travel toward the near rim of the tube linearly up the gutter they emerge onto. If they are not destroyed while in the gutter and are able reach the

near rim, they traverse along it by flipping 180 degrees from gutter to gutter until they are destroyed or they destroy the shooter.

### Tankers

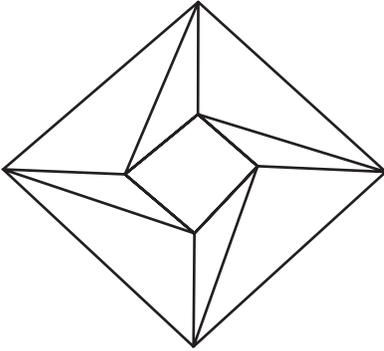


Fig. 5. Tanker

Tankers are rhombs with an embedded star polygon. They, too, travel toward the near rim of the tube linearly up the gutter they emerge onto. If they are not destroyed while in the gutter and are able to reach the rim, they disassociate into two other enemies (e.g., Flippers).

### Spikers

Spikers are rotating segmented spirals that travel toward the near rim of the tube linearly up the gutter they emerge onto, and then recede toward the vanishing point. As they move toward the near rim, Spikers deposit a spike—a line segment capped by a spiral—that originates at the far rim of the tube and terminates proximal to the near rim (or wherever the Spiker is destroyed by the player). If a Spiker is not destroyed and is able to fully recede to the far rim of the tube, it will reemerge in a new gutter or as a different enemy (e.g., a Tanker).



Fig. 6. Spiker

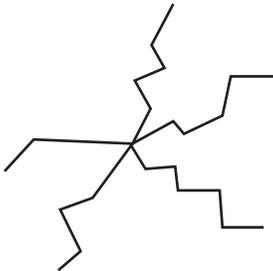
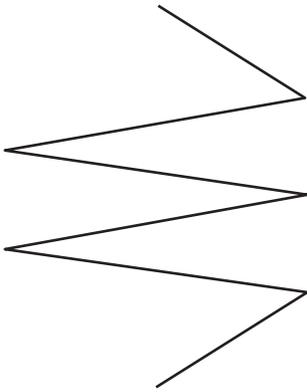


Fig. 7. Fuseball

### Fuseballs

Fuseballs are starfish-shaped enemies with five jagged line segments as arms. They are able to quickly slide toward the near or far rims of the tube along the rails of the gutters, as well as move from rail to rail, crossing the gutters at any point on the playfield.

## Pulsars



Pulsars are rail-width linked line segments that pulse rhythmically, changing back and forth between straight and jagged polylines as they move about the playfield. Like Fuseballs, they are able to move toward the near or far rim of the tube, and like Flippers they move between gutters by flipping 180 degrees. At the height of their pulse, Pulsars essentially electrify the gutter they occupy, illuminating its rails and temporarily making the gutter deadly for the shooter.

Fig. 8. Pulsar

While Flippers, Tankers, Spikers, Fuseballs, and Pulsars are the orthodox enemies of *Tempest*, the game's playfields also serve an enemy function. Not only do the various tubes shape player movement via their layout—and as a result often force shooter destruction by creating insurmountable scenarios—but also the gutters of a given tube can become charged by Pulsars and destroy the shooter upon contact. In addition, charged gutters temporarily alter the layout of the playfield itself (as, in fact, do Flippers and Fuseballs when they reach the rim of the tube and make the gutter they occupy temporarily impassible and the gutters behind it unreachable), disrupting its linearity, geometry, and the flow with which the player is able to navigate the field's topography.<sup>19</sup> As we noted above, *Tempest* contains a series of “invisible” levels (65–80) in which the tubes are rendered in black against a black background and thus are not visible to the player (though they are still navigable according to the underlying geometry of the given tube). Like the different shapes and limitations of the tubes, and the ways in which the playfield's layout can be altered by the presence and actions of the game's primary enemies, the invisible levels work to challenge player ability and undercut expectation. They also serve as a reminder of the game's overt caprice: the topography of the playfield is mutable, but player movement and possibility are not. It is the player's specific ability to adapt, rather than the game's opening up of new affordances, that is key to progressing through *Tempest*.

Finally, *Tempest*'s spare but striking visuals are complemented by an evocative soundscape, much of which is designed to offer aural clues to the on-screen action. The shooter's movement from gutter to gutter, for example, is accompanied by an audible click; the faster the shooter moves across the rim, the faster the clicks are heard, giving the player an indica-

tion of velocity without having to visually confirm it. This is particularly useful in later stages of the game when the play difficulty increases and visual attention must be primarily devoted to tracking enemy emergence, movement, and threat level. Similarly, enemy shots are accompanied by a brief tapping sound, a non-visual reminder to the player that there is an additional threat on the playfield. There are, of course, aural notations accompanying the destruction of enemies and their shots, the achievement of point bonuses and a new high score, the shooter's transition from the near end of the tube to the far end (and from the vanishing point to the star field and next tube), and so forth, all of which help both to intensify and mitigate the game's visual flurry.

Having described *Tempest's* playfield, avatar, enemies, movement and color patterns, level advancement rules, and aural components, we move now to a description of the game's technological and interactive contribution to video game design and its industrial history.

### Innovation

*Tempest* premiered a number of new features for the Atari coin-operated line, with the upright version of the cabinet incorporating the Wells-Gardner Color X-Y Display vector-generator monitor (x and y here refer to the horizontal and vertical axes, respectively), Skill-Step gameplay, an easy-to-service cabinet with casters, a 72-tooth encoder-wheel-based control system lubricated with a special gel, and a resonating chamber for the speaker (Atari 1981c, 3).<sup>20</sup> This impressive list of innovations is supplemented by the management- and service-friendly construction of the shell within which these new technologies reside:

The newly designed cabinet has casters at the back of the game, allowing you to easily move the game within your establishment. The attraction panel, with its new construction, uses a polycarbonate decal laminated to tempered glass. Luggage-style latches allow easy opening of the control panel. A wood panel separates the coin box from the components in the back of the game, eliminating the need for a power-interrupt interlock switch on the coin door. Finally, the game and auxiliary PCBs [printed-circuit boards] are mounted back-to-back on the cabinet wall and are separated by plastic stand-offs. (Atari 1981c, 3)

Clearly, the *Tempest* upright cabinet was constructed with the busy arcade overseer in mind, as well as with an eye toward the rigors of the arcade itself and the near constant need for machine repair.

Not surprisingly, the cocktail version of the cabinet was also quite innovative, with a Wells-Gardner Color X-Y Display, responsive encoder wheel, vertical coin door (for improved service access and security), adjustable cabinet height (including a standing level for non-seated play), and a cabinet design that centralized much of the game's internal workings into a single and easily accessible space. The cabaret version of the game also included new features, among them a tempered glass display shield and fluorescent tube-illuminated attraction panel (Atari 1981e, 3).

While the design and service elements of the cabinet were certainly important to arcade owners at the time, it was the color monitor and Skill-Step system that are particularly significant to the industrial, cultural, and design history of the video game medium. The Wells-Gardner Color X-Y Display was the first color x-y monitor in an Atari coin-operated cabinet; prior to *Tempest*, Atari's vector games shipped with black and white displays. As with cinema, the addition of color opened up new expressive possibilities for the video game medium—possibilities Theurer is clearly exploring via the game's static tube design (i.e., as a repeating set) but changing color palette over the course of its 99 levels. The Skill-Step system, for its part, promoted two additional incentives to play: 1) it offered a user-selectable start difficulty, and 2) it temporarily allowed the player to continue play



Fig. 9. Skill-Step  
from *Tempest Tubes*

without having to return to the opening tubes and difficulty level. Initially, the player is given the choice to start at level 1, 3, 5, 7, 9, or 11. Should play advance beyond these levels during the course of a game, the player is given thirty seconds from the destruction of the last shooter to add additional money and continue play. Otherwise, the game will reset and the player's progress through the tubes will be lost.

Clearly, Skill-Step was a boon for arcade owners as it applied direct and immediate pressure for players to purchase additional play time. We say "arcade owners" here deliberately: while the game cabinets of the day could be found in all manner of places (e.g., bars, bowling alleys, convenience stores, restaurants, airports, bus stations, and so forth), they were the primary source of revenue for arcades, where direct inducement for sustained purchase was fundamental to the business model. Thus, even though machine owners of all types could benefit from the Skill-Step feature, it was especially important for arcade owners.<sup>21</sup>

But Skill-Step was also a way for the game to maintain its freshness: as the upright cabinet's *Operation, Maintenance and Service Manual* explains, "skillful players continue to be challenged while less experienced players try to master higher levels" (Atari 1981c, 14). This differential play mechanic—unusual at the time but ubiquitous now—meant that, for example, Player 1 could start at level 1 while Player 2 could start at level 5. Depending on each player's abilities, they could conceivably each play for roughly equal amounts of time—taking turns at the controls as with other multi-player enabled arcade games of the era—despite their different starting points. This mechanic of differential play difficulty is now at the heart of many video games, and is arguably one origin point for "adaptive A.I.," that is, control algorithms that alter, for instance, enemy NPC behaviors in order to maximize player engagement. By tracking a player's in-game performance, such control algorithms dynamically make enemies neither too easy nor too difficult for players to overcome.

Skill-Step also worked to help narrativize the game's play experience, tying movement through the tubes to tropes of progress, accomplishment, mastery, performance (in the sense of the arcade as a public and performative space), journeying, and rapid decision-making. The player is incentivized, for example, to begin the game at an advanced level: there are significant "BONUS" points awarded if one forgoes the opening tubes, thus establishing a built-in story valuing bold decision-making and challenging play.<sup>22</sup> In helping narrativize *Tempest's* play experience in this and other ways—that is, in supplying the rudiments of a story to a game that did



Fig. 10. Assortment of technical documents

not readily seem to have one—Skill-Step provided a way to indirectly yet concretely supplement the game as a purely playful act, i.e., to give *Tempest* a tangible and interpretable significance beyond the refulgent but largely non-cognitive pleasures of simply doing. This type of narrativizing—perhaps sub-narrativizing might be a better term as Skill-Step is not so much a teller as it is an enabler of something to be told—helped to offset the technological limitations of the day and also to partly domesticate the abstraction of the game itself. Whereas many other games of that era attempted verisimilitude (e.g., *Extra Bases* [1980]), anthropomorphism (e.g., the naming and individual behaviors of *Pac-Man*'s ghosts), or offered titular or aesthetic indices to their content (e.g., Theurer's landmark game from 1980, *Missile Command*) as a way to both combat hardware and software limits and connect with players via the overt narrativization of play, *Tempest* did not dip into the cultural fund of easily recognizable mediated images, stories, and tropes. Atari was therefore under special obligation to domesticate the game somewhat, lest it seem too alien to be alluring to a mass audience.

There is one set of exceptions to this point. *Tempest's* promotional materials (e.g., “coming soon” flyers and posters), operation manuals, and cabinet art, all included images of fairly stock aliens: large glowing eyes, bulbous heads, sharp teeth, brutal claws, long tentacles, and so on. Given that the cabinet art was done after the game had been finished (see Theurer 1995), it was presumably designed to attract players who might not otherwise engage a machine that looked more like a geometry problem than an arcade game.<sup>23</sup> The fact that these same images were repeated on the covers of the technical manuals for the game’s various form factors is likely due to a corporate desire to maintain consistent brand identification across all components of the franchise.

The commercial need for narrativity in *Tempest* is further reinforced by the inclusion of a pause option in the game’s “Demonstration Mode,” which allows the machine operator to start at any of the first eighty-one levels, then “freeze game action so you can enjoy the dazzling effects of your journey through the tubes” (Atari 1981c, 14, emphasis in original). We say “machine operator” here rather than “player” because Demonstration Mode is not really a play mode and in fact requires the locked machine cabinet to be opened and the N13 switch assembly settings to be changed (Atari 1981c, 12). As the upright cabinet’s *Operation, Maintenance and Service Manual* explains, “The **Demonstration Mode** allows you to accelerate through 98 tubes by blasting down the tube toward the far rim without having to kill the enemies” (Atari 1981c, 14, emphasis in original). Demonstration Mode effectively removes many of the game’s ludic qualities and instead offers a travel narrative in which the tubes individually and in sum are made available for perusal, reflection, and enjoyment. The freeze option highlights and intensifies this sensibility, creating time in addition to space for the appreciation and contemplation of the journey through the tubes’ alien landscapes. Such appreciation and contemplation of game imagery and geographic progress have now become commonplace: today, tools abound for players and developers alike who wish to step through or stop altogether the unfolding of a game’s play, from non-game software for screen capture and sharing (e.g., Beepa Pty Ltd.’s *Frap*s [2012]), to games that come with their own image recording capabilities (e.g., *The Movies* [2005]).

Another of *Tempest's* innovative design elements is the “Operator-Information Display” (OID), an operator-selectable screen that, in addition to providing general information about the machine (e.g., pricing, settings, and so forth), includes usage data such as run time versus play time, total

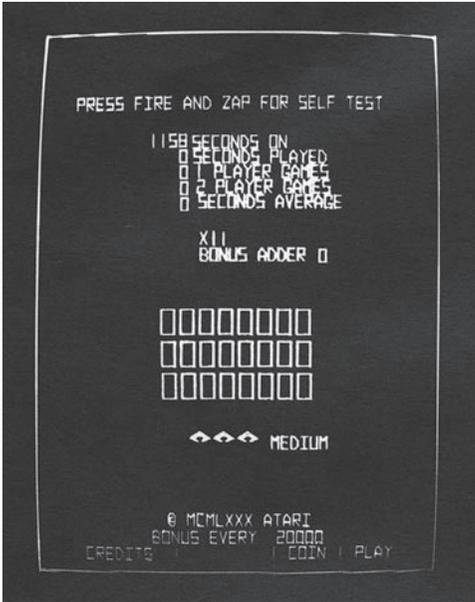


Fig. 11. Operator-Information Display

number of games played (single and multi-player), and average game time. These data would have been invaluable for arcade owners by helping them optimize the machine's profitability.<sup>24</sup> More interesting, though, is Atari's acknowledgment of the importance of game metadata, that is, of building into the machine itself tools for understanding player use and engagement. Such metadata not only articulate the study of play with the act of play, suggesting their inseparability and perhaps even equivalency (something game scholars today are now starting to explore more fully), but also foreshadow the importance of data collection to 21st-century game development and play. As a matter of course, 21st-century game developers build advanced data collectors into their games as a way to improve game performance (through bug tracking and game balance adjustment) and enhance development on content expansions and future projects. Concomitantly, today's games often display these data to players directly in the form of immediate and aggregate play statistics (e.g., total play time and top score per character class in *Team Fortress 2* [2007]) as a way to enhance the play experience and stimulate user-defined play objectives (e.g., moving up the ranked leader board in *Call of Duty: Black Ops* [2010]). That *Tempest* prefigured in 1981 these now commonplace ways of doing both game development and gameplay is remarkable.



Atari also directed *Tempest*'s data collection and analysis tools toward the game's hardware itself. In addition to displaying player usage information, the OID showed the results of a two-part "Self-Test Procedure" that enabled operators to quickly discern the game's current settings (e.g., default difficulty setting, language, multi-coin bonuses), as well as information about the hardware's soundness. Using both video and audio signals, the OID was able to pinpoint specific RAM and ROM chips that were bad, the presence of a failing mathbox, misaligned video pots, and other deteriorating or dead components. While not the first arcade game to have such self-diagnostic tools—Atari's *Avalanche* (among others) had simpler ones as early as 1978—it was innovations such as this that helped Atari dominate the video game marketplace. Such attention to the needs of players, machine owners, and service technicians alike emphasized in its time and illustrates for scholars today that by 1981 Atari had already become a mature full-service entertainment company. From this perspective, *Tempest* stands as an icon not only because of its unique game design but also because it represents an early high point of industrial sophistication. As the social space of the arcade became sedimented in 1980s popular culture, game companies had to expand beyond simple game design into full-blown manufacturing and maintenance outfits. Attendant with such expansion and public exposure was the need for machines to be repairable on-site, not only because of the expense of shipping such large hardware back to the manufacturer or calling in a local specialized repair person, but also because every moment a popular game like *Tempest* was out of service meant significant lost revenue. Arcade history scholar Carly A. Kocurek suggests that, conservatively, beginning-to-intermediate players pay about \$8.00 to \$12.00 (US) per hour to game on their favorite arcade machines (2012, 193). She also notes that in 1982, an average arcade machine earned between \$90.00 and \$100.00 a week, or about \$14.00 day. Considering that *Tempest* was no average game, the expense of having such a destination machine out of commission in one's arcade would likely have meant the difference between paying off the cost of that machine in a year instead of several months (2012, 197). Since a standard full-size upright *Tempest* machine listed at the time of release for \$2,295, the average machine would have paid for itself in about six months. Given that *Tempest* was among the top-grossing arcade machines for at least its first year (see above), a conservative estimate of *Tempest*'s coin-drop revenues is about \$2 million (US) per week (twenty thousand pre-release machines × \$100/wk) or nearly \$104 million (US) in its first year. Add the estimated \$46 million (US) in pre-release

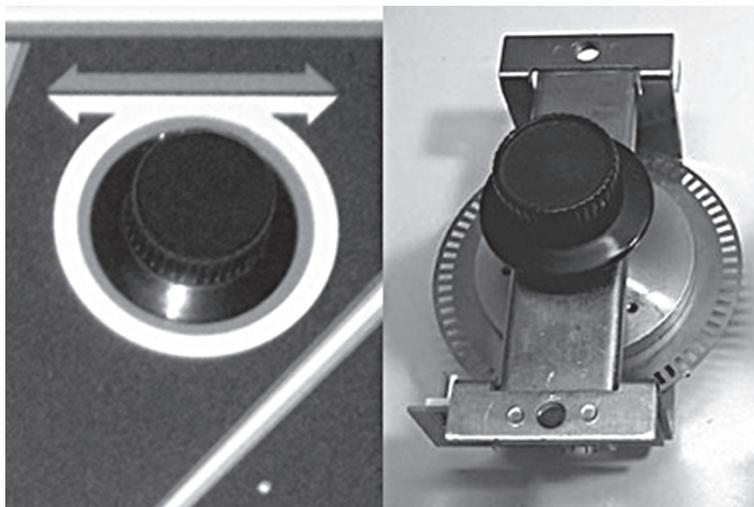


Fig. 13. Spinner

machine sales and the reason for Atari's explosive growth becomes clear: one title alone could conceivably gross more than \$150 million (US) per year.<sup>25</sup> In the year following *Tempest's* release, Atari released approximately fifteen different arcade machines, including such classics as *Xevious*, *Dig Dug*, *Gravitar*, and *Pole Position*, which equates to a considerable amount of gross revenue for the company and the people who purchased its machines. In fact, the June 15, 1981, issue of *Business Week* reported that Atari's 1980 annual revenue had topped \$425 million, suggesting that until the 1983–84 game industry crash, the company was doing very well—thanks in part to *Tempest* (“Atari's Bet,” 1981). By developing and consistently enhancing its OID, Atari maximized its games' uptime and thus the company's positive revenue stream—Atari games could be counted on by machine purchasers for easy monitoring and repair.

We would be remiss in our discussion of *Tempest's* innovations if we did not at least touch on the predominant mechanical interface to the game: the control knob or “spinner.” Again, while not the first game to use this technology—Atari's 1972 arcade game *PONG* used a similar device as part of its paddle interface, as did the Magnavox Odyssey home console system—through a number of engineering developments, *Tempest's* spinner became one of the game's signatures. With seventy-two teeth on an encoder-wheel that spun on nylon upper and lower bearings lubricated

with a specially formulated gel, the *Tempest* spinner was fast, responsive, and thus ultimately a significant contributor to what made the game enjoyable. It provided precise, instantaneous, and at that time, virtually unrivaled control of the shooter. As such, it set the stage for a host of other high-performance encoder-wheel-dependent and commercially successful arcade games, from *Pole Position* (1982) to *Discs of Tron* (1983) to *Arkanoid* (1986).

### Tempest Fugit

In this chapter we have explored how *Tempest's* aesthetics, technologies, and play logics were not only innovative for the time but have also extended forward through the decades, influencing how subsequent games look (through popularizing three-dimensionality), function (through the collection of data about players and play), and play (through the implementation of choice in difficulty level, the indirect narrativization of its play, and the physical interface's somataesthetic effects). In the coming chapters we probe these qualities and their epiphenomena more deeply, drawing out and contextualizing *Tempest's* intrinsic structures and extrinsic contributions to the life of the video game medium. To help prepare for this work, and in particular for our discussion of genre in chapter 2, it will be useful to extend the close observations of this chapter with some explication.

*Tempest's* visual design is notable for its simultaneous abstraction, futurism, and classicism. The game itself is not conventionally representational, and yet it deploys Euclidean geometries and the classical one-point linear perspective developed during the Italian Renaissance. In this sense, *Tempest* is allusory without being referential, that is, it suggests a specific intertext—in this case, ancient Greek and renaissance European art and architecture—without necessarily evoking it. This is distinctive from most of the game's contemporaries, which, as we detailed above, relied on direct visual, aural, and titular references to encourage identification and mitigate the abstraction associated with the day's technical limitations. *Tempest's* allusions are not just classical, however; they are also futuristic. The game both participates in Hollywood's growing obsession with wireframe graphics (and their instant mass association with cutting-edge technologies) in the 1970s and 1980s and hypothesizes the sorts of innovative and purposely presentational or counterrepresentational game spaces that would appear decades later (e.g., in the playfields of *Cubivore* [2002] and *Stretch Panic* [2001]).<sup>26</sup>

But *Tempest* designer Dave Theurer was doing more than mimicking Tinseltown's love affair with special effects, and more than merely symbolizing the mathematics of shape and landscape. He was also probing the surface and depth of the screen itself. Play in *Tempest* is predominantly confined to on-screen space. Not only is the shooter pinned to the tube in play (and, more precisely and finitely, to the near rim of the tube), but there is no diegetic action—action within the play space specifically—that occurs beyond the tube itself, save that associated with the vanishing point out of which the enemies emerge.<sup>27</sup> In contrast to games such as *Asteroids* and *Pac-Man*, which purposely exceed the visible limits of the screen by allowing avatar transit off-screen and making such movement part of successful play, *Tempest* disavows the possibility of navigating that which is unseen but present.<sup>28</sup>

To be sure, the game's enemies emerge from somewhere and the transit from one tube to the next implies additional space—what we might call deep Z-space—beyond the visible scene, but neither of these implied spaces is strategically accessible to the player.<sup>29</sup> When on or in a tube, the shooter is visible and controllable. After leaving the tube and transitioning to the next one, the shooter disappears, and there is nothing for the player to control and no distinctive playfield to navigate. Indeed, it is a moment and a topography that acknowledge the potential depthlessness of the screen while at the same time obviating the surfeit of meaning such a space might potentially provoke. Theurer is exploring how deep the screen goes, and thus the game is also a meditation on play and movement in terms of the limitations of a bounded visual field. In this sense, *Tempest* recalls some of the ways in which film and television often use off-screen space to explore and transcend the space framed by the camera's limited ability to capture space.<sup>30</sup>

In essence, then, Theurer's simultaneous probing of surface and depth is both expressive and theoretical. It is a playful and artistic experimentation with the sense-making possibilities of the medium, and at the same time a study of one of the key sensibilities these possibilities produce: immersion. The inviolable fixity of *Tempest's* tubes and the subsequent breaking of that fixity during the transition between them points to contiguous (and even contradictory) states of immersion:

On the one hand, immersion denotes the idea of envelopment, of being completely and inescapably surrounded. . . . [Games try to] attend to the player's sensorium by appearing everywhere, aurally

as well as visually (and kinaesthetically too in the game itself). On the other hand, immersion can also be expressly agential, sometimes violently so, involving thrusting something into something else as in hot metal into cold water or cold hands into a hot bath. . . . So, “immersion” conjures both the ubiquity of being surrounded and the act of achieving that state—arguably two very different phenomena in the kinds of meanings they produce and enable. (Ruggill 2009)<sup>31</sup>

With *Tempest*, Theurer is offering an early and intriguing commentary on the role of these two states in computer game design and play. For him, the states form a dialectic, and it is in their mutual constitution and inflection that the medium reveals its particular expressive power. We now look to this expressive power as it is manifested in genre and explore *Tempest*'s connections to its precursors and antecedents.