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Cave Gave Game: Subterranean Space as Videogame Place

by Dennis Jerz and David Thomas

2015-10-06

Jerz and Thomas identify our fascination with natural cave spaces, and then chart that fascination as it descends into digital realms, all in order to illustrate the importance of "the cave" as a metaphor for how we interact with our environment.

Note: This essay is a part of a "gathering" on the topic of digital and natural ecologies.

In the popular conception of game development, fantastic videogame spaces are whimsically spun from the intangible thread of computer code. Like literary authors, videogame developers take on the roles of dreamers of new places and inventors of new worlds. This popular notion remains at odds with the relatively small number of formal game spaces typically found in videogames. In his chapter "Space in the Video Game" Mark J.P. Wolf settles on a total of only eleven possible spatial constructions in games (Wolf). Instead of a constantly expanding set of game topologies, the medium has settled on a discrete set of spaces. Inside this set of possible spaces, the majority of game space relates to specific real-world locales and architectures: cities, buildings, outdoor locations and, perhaps more frequently than we realize, caves. Mimetic pressures in the modern videogaming industry both encourage and respond to the tastes of players who wish to play inside familiar spaces, whether via the imagined Martian research bases of the *Doom* series or the recreated race tracks of *Forza Motorsports*. Even when the space on the screen represents impossible vistas, such as the isometric perspective of *Civilization* and *SimCity*, gameplay depends upon the player's sense of experiencing (and controlling) an environment that seems real.

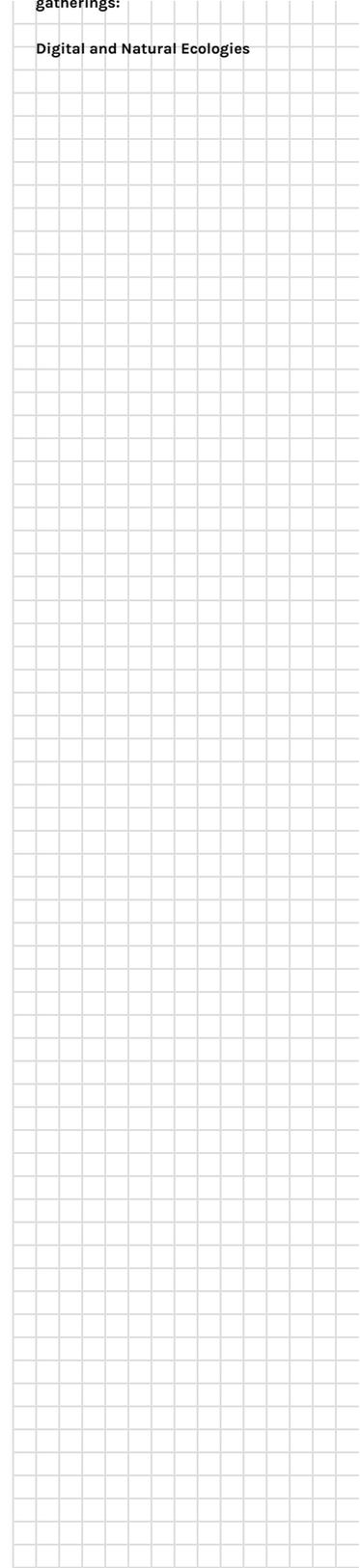
As fictive worlds, games depend on their use of space, much as narratives depend upon time. Reading game worlds through a spatial lens invites comparisons to environmental literature, for, according to Michael P. Cohen, one purpose of environmental literature is "to express [...] the joy of the wide-open spaces." In reference to the (possibly apocryphal) story about the short-sighted publisher who rejected *A River Runs Through It* because "[t]hese stories have trees in them," Cohen further posits that "[a]ll published or even manuscripted narratives have trees in them because they are made of trees." In each separate comment, Cohen aimed to be inclusive; however, the celebration of wide-open spaces via the printed page seems to exclude the topic of this study - an eco-critical reading of cave space in videogames.

Cave space, which sits in a peculiar contrast to surface environments, has long held a place of difference in the human experience of natural environments. Cave space entered the vocabulary of computer games very early in their development, thus linking at a deep level the idioms, metaphor and structures of gaming and caving. A reading of cave space as a form of videogame space enables a better understanding of the qualities of those digital experiences.

This essay examines cave space in opposition to sandbox space. The two terms describe a difference between configurable and non-configurable environments. Unlike the forest and fields, which can be configured to suit human needs, or the sandbox, which invites endless reconfiguration, the cave has, since antiquity, been seen as a non-configured (or perhaps less-configured) environment. Above ground, where stone walls can be moved, humans adapted the environment to themselves. Below ground, humans added paintings to the walls, but had to, or were willing to, live within the walls themselves.

This essay appears in these gatherings:

Digital and Natural Ecologies



From Cave to Game

The preface to *The Longest Cave*, Roger W. Brucker and Richard A. Watson's 1976 account of the exploration of the Mammoth Cave System in southwestern Kentucky, warns:

It is utterly different in a cave. Within seconds you lose sight of your starting point. The sinuous passages twist and turn. Always you are confined by walls, floor, and ceiling. [...] The route is never in view except as you can imagine it in your mind. [...] The only sign that you have reached the end is that you cannot go on. And there is no view. (xiv)

A cave space that is a static destination for today's explorer was once a conduit for the ancient flow of water, which followed the path of least resistance through solid rock. Over a period of several decades, hundreds of volunteers with the Cave Research Foundation (CRF) have trudged, clambered, crawled, sloshed and swum their way through hundreds of miles of caves, in search of unexplored passages. Through their efforts, what had been historically thought of as five separate networks of caverns in the area were methodically explored, painstakingly mapped, and gradually linked. When CRF member Pat Crowther squirmed through a muddy tunnel in September of 1972, she formed the final link in the chain, thereby establishing Mammoth as the world's most extensive subterranean network – that is, the “longest cave.” Cavers considered the feat to be “the Everest of world speleology” (Brucker and Watson xi). Perhaps the most poignant passage in the book describes Pat returning home to her husband:

Will was waiting. They held each other and talked about the connection. At midnight, Will was asleep, but Pat could not sleep. She got out of bed and went to the computer terminal in their living room to type in the bearings and distances of the survey. By 2:00 a.m. this was done. Then she could sleep at last.

The next day Pat edited the output from the computer and ran the coordinate program. A long paper tape was punched out. Then Pat and Will took the tape to Will's office. There the computer plotter drew the map of the connection route while they watched. [...] Would her children remember this excitement in later years? Now they were young, and caves had always been a normal part of their lives. (253)

The social aspect of caving suggests that the mystery of a cave is only fully revealed above ground, where it can be recalled, shared, and recorded. The book's epilogue reaches yet another intimate note: “We did it because we love the cave and one another. The sharing of this adventure has provided us with some of the most satisfying hours of our lives” (255).

Shortly before *The Longest Cave* was published, Will and Pat Crowther's marriage suffered a crisis that led to divorce. Will, a programmer who was part of the now-legendary Bolt Beranek & Newbold team that built the precursor to the Internet, suddenly found himself seeing his two small daughters only on holidays. Feeling isolated from them, and also seeking something clever to share with his *Dungeons and Dragons* friends, Crowther wrote a computer program that textually re-created a small section of the Bedquilt region of Colossal Cave. The result, *Adventure* (c. 1975-76), invented the genre that would later be known as the “text-adventure game” or “interactive fiction.” In his exploration of hacker culture, Steven Levy interprets Crowther's influential game as “a metaphor for computer programming itself - the deep recesses you explored in the *Adventure* world were akin to the basic, most obscure levels of the machine that you'd be traveling in when you hacked in assembly code” (132), i.e. interactive media representation of a natural space. In a 1990 item in the Cave Research Foundation Newsletter, Mel Park says of the 1970's mapping efforts, “I don't think anyone was satisfied with that effort, though, even then. The old problems of evolving standards riddle the data: no backsights, no vertical control, poor sketches,” and notes that CRF re-mapped the same site in the 80's “to correct these deficiencies” (Park 7). Just as novelists or painters or artists in any other medium are limited by the quality of their tools and subject to changing tastes and standards, Crowther drew on his personal talents and aesthetic values as he created his map, and also his game. The game deserves our particular attention because of its participation in thousands of years of human interaction with caves, reflecting and illustrating their meanings as places of mystery, shelter, wonder and leisure.

Crowther's translation of real world caving experience into the digital medium provides a precise bridge between the cave as environment and the cave as game design metaphor. The decision to represent the player's caving experiences in a text-based format was practical, owing to the limited graphics capabilities of early computers, the difficulty for potential players to gain access to such computers, and the comparative ease of programming a textual interface rather than visually representing the game's topography. When considering the impact that *Adventure* has had on game design since, the connecting of cave space to videogame space remains a moment of importance that, perhaps, mirrors the significance of Pat Crowther's discovery of a narrow passage linking two vast, sprawling networks, previously perceived as unconnected.

What Will Crowther accomplished through this experience was another connection, this time between literacy and gaming. Literature transforms, through interactions governed by rules, into a game. *Adventure* was not the first computer game, nor was it the first to accept textual commands, nor the first to emulate something resembling conversation.¹ Still, by forcing the *Adventure* player to experience his cave world through text, and later by freely sharing the source code that permitted other programmers to extend the known cave, Crowther manifested the powerful transformative potential of the Internet, and in the process deeply embedded caving values and assumptions into the very fabric of gaming culture.

In *Adventure*, the player collects items, discovers a cave entrance and enters an underground maze spun of words and imagination. As Espen Aarseth has noted (*Cybertext 5*), this kind of text creates a narrative labyrinth which parallels the topological labyrinth. In each case, the participant travels through a winding set of paths toward some unseen goal. The labyrinthine structure of the cave mirrors the complex branching and confluence of a multi-linear story. And in each case, within the very real constraints of cave or code, the explorer/player becomes an active participant.

This interactive fiction interface is a command-based textual feedback loop: the computer displays a few lines or paragraphs of text; the interactor types a command; the computer describes what happens next, and then waits for additional input. In the example below, from the beginning of *Adventure*, the player's input is marked with the ">" symbol.²

YOU ARE STANDING AT THE END OF A ROAD BEFORE A SMALL
BRICK BUILDING. AROUND YOU IS A FOREST. A SMALL STREAM
FLOWS OUT OF THE BUILDING AND DOWN A GULLY.

>GO BUILDING

OK

YOU ARE INSIDE A BUILDING, A WELL HOUSE FOR A LARGE
SPRING.

In a dissertation on game ecology, Alenda Chang spots in the endless and potentially alienating linguistic negotiation "the orthodox Cartesian dualism between mind and body or philosophy's brain in a vat" (12), and notes that actions in such games "are often leaps of faith." While no computer game forces the player to perform any action, *Adventure* rewards only those actions that support the acquisition of riches (both human artifacts and natural resources) from the caves. The brick-and-mortar well house was, according to Cave Research Foundation members, part of a group of similar structures built by the National Park Service, in order to pipe water to facilities used by park visitors and employees. While Crowther's game featured treasures far more exotic than water, the acquisitive premise of the treasure-hunt component of the game echoes the purpose of the real-world structure.

Crowther worked on his game during the 1975-76 academic year, showing it to his children when they came to visit him during school breaks.³ Jerz's interviews with Crowther and his family support the 1975-76 span, and no evidence contradicts it. At some point after Crowther stopped working on the game, Stanford University grad student Don Woods found it on a computer at the Stanford campus, expanded it, and re-distributed it online. While Woods has offered 1976 as the date he published the collaboration,⁴ the earliest extant version of the Crowther/Woods version is dated 1977. Woods acknowledges *Adventure*'s parser was primitive (qtd. in Montfort 89), and notes that the game had nothing to do with the professional activities of the Stanford Artificial Intelligence Laboratory (Woods).

The form reinforced the content, and vice versa, offering what Montfort characterizes as "the default (underground) environment" which "drew

NOTE 1.

In *Twisty Little Passages: An Approach to Interactive Fiction*, Montfort aptly traces the influence of *Adventure*'s precursors, such as "ELIZA," "SHRDLU," and *Hunt the Wumpus* (the latter of which was also set in a cave).

NOTE 2.

For a more detailed introduction to the interactive fiction genre, the reader is referred to <http://jerz.setonhill.edu/ef/intro.htm> or http://en.wikipedia.org/wiki/Interactive_fiction.

NOTE 3.

Earlier dates for *Adventure* are frequently found in published work. "Most commentators and critics of the adventure game genre [...] fail to mention the original *Adventure* at all, and those who do usually date it far off the mark," according to Espen Aarseth, who counts himself among the guilty (*Cybertext*, 107).

NOTE 4.

When asked when he began working on the code, Woods answered, "I don't recall the exact day, but it was early in 1976, perhaps March or April." ("Interview with Don Woods.")

together a simulation of cave exploration, magic, and problem solving to create a work that had the archetypal texture of a text adventure" (Montfort 91). *Adventure* demonstrates not topography but "ergography" (Aarseth, "Nonlinearity" 773), that is, the user must expend considerable effort interacting with the program in order to get it to divulge sufficient information to facilitate a conceptualization of the unfolding space. The name of the game soon became a generic descriptor, like Kleenex and Band-Aid. Encounters with *Adventure* soon inspired *Zork* (created in 1977 by a group of programmers at MIT who founded the software company Infocom, which would during the 1980s publish a series of games set in "The Great Underground Empire") and *Adventureland* (the first commercial computer game, created in 1978 by Scott Adams, who founded Adventure International).

Citing it as one of the few games that avoid the pitfalls of cliché and oversimplification in order to create "not only a more responsible game experience but also a more compelling one" (10), Chang praises the "site-specific subterranean world" of *Adventure* for its achievements in ecomimesis (as defined in Timothy Morton's *Ecology Without Nature*), and notes that "The economy of *Adventure*'s language allows for both the game's ecomimetic properties and its captivating ambiguity" (14). We know caves gave us *Adventure*. Through its imitators, caves also influenced many of the enduring structures, not only of text-adventures, but of mainstream videogames, including in particular first-person shooters. Just as the *King James Bible* continues to influence the speech and thought of contemporary English speakers (even those who aren't British or don't go to church) *Adventure* has great cultural significance in computer game history (even for gamers who have never seen a command-line interface). But what does the cave mean to videogames? And how does the experience of caving translate to the experience of playing in cave space in games?

Caving Games

The forces that shape hacker culture are described in works such as Tracy Kidder's *The Soul of a New Machine* (1981), Steven Levy's *Hackers* (1984) and Neal Stephenson's *In the Beginning was the Command Line* (1999). Each describes the culture of programmers as communal, open, and egalitarian. Caving culture, by contrast, is far more hierarchical, as suggested by the very existence of the *Cave Research Foundation Personnel Manual*, which in its second edition in 1975 was a crisp and thorough 110-page artifact that included a legalistic membership document. Of course, intense cavers may run the risk of injury or even entombment (a fate that in 1925 befell Floyd Collins, a lone-wolf caver whose entrapment in Mammoth's Sand Cave sparked the first modern media circus). In any case, the manual offers enticing glimpses into caver culture, as it was practiced by the Cave Research Foundation in 1975. The fascinating description of a 1965 safety drill involves elaborate underground role-playing, facilitated by the passage of notes:

[P]arty leader Don Black produced a note signed by R. Watson stating that the party was to initiate a practice rescue. Party member Paul Black, the victim, was suffering from such injuries as Don might describe. The party would conduct themselves as they would in the event of an actual emergency. Don at this point wrote a second note stating that Paul had fallen from the ladder, had a broken tibia, had an almost certain back injury, was unconscious, and had no external bleeding. (55)

The section "What To Do When Lost" suggests establishing a base with a note and a lighted candle, and then exploring out and back from your base in brief sorties, "making a sketch as you go; leave a note where you stop in each direction. Use your developing map to decide which lead to push further on slightly longer sorties. [...] It will provide a psychological boost to everyone to know you are working rationally and systematically to locate known passages" (46). Any player who has ever been stuck in an old-school text-game maze knows the comfort value of seeing that map grow. Even action-oriented combat games often feature auto-mapping or mini-map displays to accelerate the pace, and provide a sense of location in twisted and usually linear place spaces. The cavers described in *The Longest Cave* notes "accepted surveying as an integral part of exploring, and for many of them, making the map is one of the central pleasures of caving" (55).

Caving requires certain specialized equipment, the importance of which is suggested by the inventory items the player encounters inside *Adventure*'s

L'avventura è l'avventura 2001.
<https://web.archive.org/web/20031107155218/http://w>
However, no extant copy of the Crowther-Woods collaboration bears a date earlier than 1977.

brick building: a key, water bottle, food, and a “shiny brass lantern.” The key is easy to explain; in Mammoth Cave National Park, cave entrances are normally kept locked, via grates installed by the US Park Service, and each party of 2-4 cavers is issued its own key (33). In the chapter entitled “Caving Equipment,” the handbook lists, among other items, “Food” (because cavers typically eat one or two meals on an expedition), a “Container for lamp water,” and “Metal carbide lamp.” Carbide is a substance that reacts with water to produce a flammable gas. Crowther supplied the game with a lamp, a bottle, and a source of water - but no carbide. Cave Research Foundation member Tom Brucker, who worked with the Crowthers on their intensive 1974 survey of Bedquilt, assumed the brass lantern would run out of carbide fuel, and recalls anxiously looking for a fresh supply while playing the game in the mid 70’s. *The Longest Cave* illustrates cavers dealing with resource- and inventory-management decisions that are a large part of role-playing games (RPG), as when an experienced caver says, “I never thought a flashlight was worth its weight to carry, it burns out so quickly” (15). Other items that are not implemented as objects in the game, but whose presence is implied, include a pack and a compass. The CRF manual offers a thoughtful soliloquy on the ideal proportions and strap configuration for a cave pack (26), and a whole chapter (authored by the Crowthers) explains the use of a compass as part of a map-making survey.

Many academic studies mention *Adventure*, the most in-depth being Mary Ann Buckles’ 1985 Ph.D. dissertation, which offers a sociological and generic reading of the game (with references keyed to a listing of the FORTRAN PDP-10 source code of the Crowther/Woods collaboration). Yet her assessment leaves much to be said, because for Buckles, studying *Adventure* means either comparing the structure of the game text to established traditional literary forms or observing what happens when novices play the game. Rather than analyzing *Adventure* itself, Buckles analyzes the complex back-story generated by test subjects, as they drew upon “strong feelings and memories of associated events from their own lives” (178) in order to interpret events in the game world. For instance, one subject, after successfully using the birdcage to catch the bird, tried using the cage to solve other puzzles as well. “After it became apparent that she would try negotiating with the animals, avoiding them, appeasing them, feeding them - anything but kill them, even when they were attacking her - she and her playing partner had a philosophical argument as to the validity of her attitude” (128). As non-hackers first encountering the game in the mid 80’s, Buckles’s test subjects were unconnected to the culture that had initially embraced the game a decade earlier.

A full review of the literature relevant to *Adventure* is beyond the scope of this essay, but Levy’s *Hackers* lushly describes the techno-fetishistic environment at MIT on the cusp of the computer revolution:

Wandering around the labyrinth of laboratories and storerooms, searching for the secrets of telephone switching in machine rooms, tracing paths of wires or relays in subterranean steam tunnels. [...] for some, it was common behavior, and there was no need to justify the impulse, when confronted with a closed door with an unbearably intriguing noise behind it, to open the door uninvited. (3)

Kidder’s *The Soul of a New Machine* offers an equally indispensable account of the context in which *Adventure* was originally experienced-covertly, after-hours in the basements of university and corporate research buildings. In an article on popular medievalism in digital culture, Courtney M. Booker gleans from canonical sources a clear overview of what is generally understood about how J.R.R. Tolkien and *Dungeons and Dragons* influenced *Adventure*. From the evidence laid out by Booker, we can surmise that key conventions of fantasy literature and tabletop gaming would likely have made their way into the world of computer games even if it were not for *Adventure*, but Booker’s synthesis is consistent with the present study’s assertion that the cave setting was perhaps as important to the development of computer games as the exploratory premise and the command-line parser mechanism. In the typical text adventure, the player is assumed to share the desire to map a strange landscape populated with various objects, some useful, some dangerous, the properties of which must be determined via experimentation (and often trial and error). Since we know Will Crowther was not designing his game experience for a mass audience, but rather a small group of people he knew very well, it is understandable that the game gives much pleasure to people who enjoy mapping complex spaces and solving mental puzzles, and holds less charm for those whose tastes vary. Crowther’s caving game did not make hackers everywhere suddenly want to run around solving puzzles in

mazes (virtual or real); rather, the problem-solving appetite was already present among certain groups of potential users. Players who lack this appetite find themselves quickly frustrated, like the novice player who saw *Adventure* as an exercise in non-violent problem-solving, and encountered an unpleasant disparity between her values and those implicit in the gameplay.

Caves in Human Culture, Humans in Cave Culture

We cannot know when our ancient ancestors first decided to take shelter in a cave, but we can imagine the circumstances. Caves are dark, their air damp and fecund. No person, primitive or modern, would wander far from the opening of any cave without light, except in the direst of circumstances, facing certain death. And what of the cave itself? Its natural shelter beckons to more than humans. And the thought of a toothy creature coiled in the cave's recesses remained an uncomfortable uncertainty. The cave must have been a complex place for early people. It promised simultaneous easy shelter and sudden danger. It is what architectural critic Paul Shephard calls the "multivalence of the landscape" and what has also been eloquently summed simply as the cave's "mystery" (40).

Shephard argues that without people, the landscape simply exists. When people enter, landscape becomes complex and filled with meaning. We bring, or perhaps create, the sense of danger and safety to the cave. A cave is only a natural feature before people arrive to fill it with thoughts, ideas and narrative. People transform the landscape into a canvas of meaning. And whatever else early people thought of the caves they encountered, they transformed the cave as a concept even as the cave formed them. We create the mystery.

Perhaps most relevant to the current inquiry into the relationship between caves and games is exactly how early people used caves as a place for art. Marshall W. Fishwick marvels at the 30,000-year-old paintings of hunting scenes in Chauvet: "The paintings are meticulous and convincing with clean sweeping lines. Many are accurate and beautiful by any standard." While "[a]rrows fly and animals die," few humans appear in the paintings; those who do are usually "shamans wearing animal skins or horns" (73). Twentieth-century attempts to explain these images posit the cave as a powerful symbol of the womb, and the site for rituals designed to help the hunters kill and to ensure that the prey reproduce so as to benefit future hunts. Caves acted as a medium of symbolic communication. They were an ur-scroll for recording images, thoughts and feeling. But even more so, the caves themselves were a medium, conveying an applied meaning while persisting as an environment of their own.

The artists exploited the natural architecture of each cave and conjured an inseparable whole between this and their own images. There was no attempt to change the given configuration, by dropping the floor level, for example, or expanding narrow passages. On the contrary, the difficulties were scrupulously respected and the artists set out to complement the particular properties of the cave. (Kosto 24)

While we do not know exactly why early people drew on the walls of caves, we do know that the early caves could have been configured in the sense of physically altering the shape of the space. But were not. Instead, the place defined the ritual, whatever that ritual must have been, and the ritual was written in rules. The rules were reflected in immovable rock walls of the cave.

This notion of the cave as a place to apprehend rather than configure through gross modification remains with us today. Tourist caves (the most extravagant of which, featuring colored lighting and restroom facilities, are known as "show caves"), where policies prohibit touching or altering of natural features and the "wild caves" that are gated and locked (for both conservation and safety purposes). This respect for the structure of cave space has a mirror in the design of games which require rules, implemented in the immutable code of the game's software.

For Henry David Thoreau, in *Walden*, a cave contains unknown wonders that draw the core of our being:

Who does not remember the interest with which, when young, he looked at shelving rocks, or any approach to a cave? It was the natural yearning of that portion, any portion of our most primitive ancestor which still survived in us.

At the same time, the cave diminishes as space, its utility being attached to a point in the past:

From the cave we have advanced to roofs of palm leaves, of bark and boughs, of linen woven and stretched, of grass and straw, of boards and shingles, of stones and tiles.

To support his claim that people should spend more time outdoors, with no barriers between themselves and the heavens, he notes “birds do not sing in caves.”⁵ Later, Thoreau chides a news-addicted man for “never dreaming the while that he lives in the dark unfathomed mammoth cave of this world, and has but the rudiment of an eye himself.” Thoreau is here mocking this representative man’s perception of the world as unfathomed and dark (as composed by pockets of what the present study terms non-configurable space). Returning to the image of a cave as a familiar and shared space, Thoreau imagines what he calls “a cavernous house,” a utilitarian structure “of enduring materials, and without gingerbread work, which shall still consist of only one room, a vast, rude, substantial, primitive hall.” Thoreau is keenly aware of the tension between the two kinds of space we have called sandbox space and cavespace. He longs for “[a] house whose inside is as open and manifest as a bird’s nest, and you cannot go in at the front door and out at the back without seeing some of its inhabitants; where to be a guest is to be presented with the freedom of the house, and not to be carefully excluded from seven eighths of it, shut up in a particular cell, and told to make yourself at home there - in solitary confinement.”

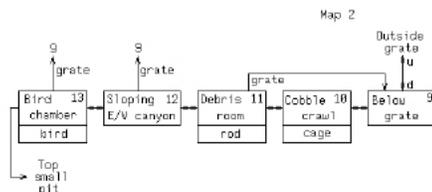
With his background as a caver, it is not particularly surprising that Crowther brought the notions of a non-configurable, multivalent and mysterious space from the activity of recreational caving into his game design. The fact that Woods, who had never visited the cave, followed Crowther’s lead and preserved non-configurability in the environment is perhaps more telling. Woods’ demonstration of skill in extending and improvising upon Crowther’s original vision manifests the clear transmission of a cave experience into the game design process.

Today, we still see this design philosophy in action. Steven Poole laments the functional incoherence of a rocket launcher that cannot blow up a wooden door or destroy a rock wall to create a new passage in a corridor (51). And while his critical point-of-view on contemporary games remains valid from the standpoint of the verisimilitude of the game world, what is more notable is that “non-configurability” remains prevalent enough in design to deserve his comment. Designers rely on non-configurability of space. Whether or not the non-configurability of cave space drives game design, the notion of non-configurability reflects and echoes the cave even when its direct influence is indiscernible.

In the past, this non-configurability may have as much to do with a lack of computer power and memory necessary to track a destructible environment. But even as the technology provides the power to game designers to add this kind of feature to their games, the notion of non-configurability will most likely remain. The game space as a form of the game rules, shaping the experience and even driving the narrative will remain a strong incentive for non-configurability. In the same way that the non-configurability of cave space defines, in many respects, the experience of the cave, non-configurability of games has defined their character since Crowther committed the idea to software.

Caves of Doom

You are a space marine trapped on a Martian base, where something has gone very wrong. Minions of hell have leaked through a dimensional portal, and the hunt is on as you tromp through levels of the base, seeking monsters and dispatching them with your arsenal of weapons. Welcome to the classic PC game *Doom* (1993). Setting aside the fantastical aspects of the narrative and setting, the level maps from *Doom* reveal something quite interesting.



NOTE 5.
The “cheerful little bird” of *Adventure* is, perhaps, an exception.

Figure 1: *Adventure* Map 2, Warren Toomey, early 1990s. Reproduced with permission. Available:

<http://www.rickadams.org/adventure/maps/advent2.gif>

Rather than appearing as a classic plan for a building, with the contiguous walls and compressed use of space you would expect in the real world, the network of rooms and passages mirrors the structure of a cave. The corridors twist and turn, and the interior spaces are bound by thick walls of impenetrable volume. Without aid of a visual map, the player loses sense of roaming a physical base as a building and instead experiences it as a narrative location. Rooms are connected to other rooms and the broader plan never emerges in player's minds nor even occurs to them.

Compared with a similar map from *Adventure*, the functional parallels emerge. The figure below shows the first few underground rooms in *Adventure*, as represented by Warren Toomey's map. Arrows depict connections between discrete game areas known as "rooms," while "bird," "rod" and "cage" are objects that can be picked up and manipulated in order to solve puzzles.

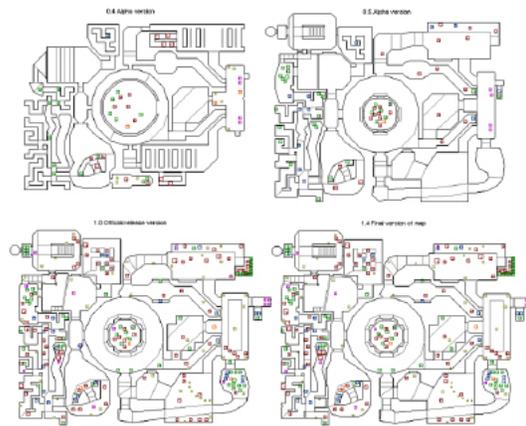


Figure 2: *Doom* level map from Wikipedia

(<http://en.wikipedia.org/wiki/Image:DOOM-E1M4-development.png>)

Both *Doom* and *Adventure* present the player with a series of rooms which contain objects and possible actions.

In *Doom*, the player-character navigates through a hostile environment, conscious of the possibility of ambush around each corner. A maze of twisty little passages creates more anxious moments of discovery, urging the player to move forward, leaving a trail of rooms behind as a record of the past. In more current versions of *Doom* and similar games, players will often fire a weapon at a wall, marking it to aid in navigation. The space is not topologically rational, and much as cave explorers are encouraged to leave notes in newly explored cave tunnels to aid in the creation of a mental map of connected rooms, so do videogame players build their mental maps with shotgun blasts to wall when lacking other navigational aids.

This notion of a game level as a cave works as well for *Doom* as it does for *Adventure*. Even more, the notion of game level as cave transcends even the confines of building interiors. As James Newman aptly notes, "the broad distinction between 'indoor' and 'outdoor' game spaces is something of a misnomer" (118). He points to the restrictiveness of the game space as its most salient topological feature, and even points out that outdoor levels in *Doom* work in an identical fashion to its indoor levels.

Following the notion further, we find that restrictive space is inherent in all games. Even a title held up as the progenitor of open-ended sandbox play such as *Grand Theft Auto III* provides a very cave-like map. At the beginning of the game, the player is restricted to one of three islands. As the play progresses, each island becomes available. These islands operate as primary cave chambers, each filled with different local topologies. Throughout the ample urban and suburban landscape, the vast majority of buildings are non-enterable, the doors and windows being inoperable scenic bitmaps. So the architecture becomes a de facto set of solid walls and columns. Driving a car or truck at full speed into most of these buildings will show they are unrealistically non-configurable, as the vehicle bounces off wood and stone alike without causing damage to the structure.

This point reveals itself in greatest clarity when the player discovers the game's subway. Even though the subway does not provide any specific

advantage to the player - in all cases it is faster and more practical to use surface transportation than the game city's subterranean transport - the sense of wonder at discovering the subway is palpable. The subway reveals literally and metaphorically the cave-like connection of places (rooms) rather than a surface topology flowing space connected.

The idea of subway as a form of cave space finds literary power in the work of Haruki Murakami's novel *Hard-Boiled Wonderland and the End of the World*. In this tale, he imagines both caves and a walled city as narrative metaphors for consciousness. When the un-named hero of the book emerges from the dark, damp, dangerous and symbolic space of the cave, he finds himself in the subways system of Tokyo. In Murakami's telling, the subway is a civilized cave, a sort of purgatory offering a transition from the mythic cave into the un-cave-like space above.

In a similar fashion, the subway in *Grand Theft Auto* acts as a reminder that the world above in a game actually a cave too. In this game, the subway does not matter as a mode of transportation. It stands as a connecting metaphor which returns the player to the context of the cave. Oddly, even though the game is championed as a sandbox title, it is really, like Crowther's experience of a cave, a largely non-configurable space (albeit richly realized) that provides an environment for play.

Though *Grand Theft Auto III*'s maps were limited by the hardware processing power of its era in gaming, future installments in the franchise still held to the basic model. In *Grand Theft Auto V*, for example, a subterranean network of tunnels lies under the sprawling Los Santos megaplex. And the addition of interior spaces-homes and business-replicate the basic structural idioms of the cave rooms. You can enter these rooms but you cannot modify them; you can explore them, but the space sits as stoic and immutable as if made from rock. The openness of the *Grand Theft Auto* world remains framed by the static locations, the enclosed spaces and the general immutability of the world. While not representationally cave-like, games like *Grand Theft Auto* continue to operate to a degree within the constraints of *Adventure*'s cave narrative.

The success of *Minecraft* appears to challenge and edify the idea of caves and games. Players inhabit a world where the game involves configuring any of the seemingly infinite blocks that make up the world, digging, stacking, building and, of course crafting. So, while the algorithmically generated world appears intact at game start, within minutes, players start to work digging up the soil, knocking down trees, creating primitive huts to guard against the hostile elements and building tools - shovels and picks and axes - to speed up the terraformation of the landscape.

True to the game's title, mines become an important feature in the game. Players dig vast networks of tunnels in search of valuable ores and gems. And the time tunneling underground eventually leads to the discovery of caves. Sometimes these caves have traditional openings on the surface. But just as often, they are hidden recesses under the earth. They may be filled with pockets of water or lava. And they inevitably house monsters.

Players stumbling into caves cannot help but feel a sense of wonder. Like wandering off a dark street into a cathedral, the boxy graphics of *Minecraft* conjure an experience of the sublime. More so that the beauty of the mountains and valleys or stretches of seas and rolling forests that populate *Minecraft*, it is the caves create the game's most powerful moments of wonder. And not surprisingly, the caves and mines of *Minecraft* hold its most rare and valuable resources.

It is on this point that *Minecraft* returns to the same source of narrative power that drives *Adventure*. At its heart, *Minecraft* is a resource management and crafting game. Collect wood from trees and rocks from stone to create a primitive stone axe to speed wood chopping, a shovel for digging, and an axe for breaking rocks. Discovery of coal, seams of the valuable material often lacing the walls of cliffs and cave entrances on the surface, combine with lumber to create torches. Torches provide the light necessary for deeper exploration of the ground under foot. Underground exploration is essential in *Minecraft*. Because if the name of the game did not make this clear, the majority of resources necessary to enjoy the game are underground.

In the game's geometry, the lowest level players can dig to is represented by $Y=0$. The top of the game is $Y=256$. Sea level in the game is set at $Y=62$. Topological variation ensures that mountains and earth can rise dramatically above the sea, and water can flow into below-level pockets. But the basic

model puts roughly 1/3 of the game's space below sea level (<http://minecraft.gamepedia.com/Altitude>).

Despite this, graphs of the allocation of resources in these computer-generated worlds show that the vast majority of needed material exists below sea-level. In the world of *Minecraft*, that means you have to dig and explore underground to acquire the necessary iron, gold, diamond and more. Even wood, abundant on the surface in forests, appears underground as salvageable lumber discovered in abandoned mines.

What *Minecraft* argues, even as its meta-narrative only speaks generally to exploration and survival, is that what is below is essential. From the dark and dangerous recesses of the earth come the things that make life worth living. And while *Minecraft* players have no reason not to construct their own Mines of Moria, inspired by Tolkien's dwarves, they might also heed Wizard Gandalf's warning of digging greedily too deep. But of course, all players do and face the dark and danger deep in the world's caves.

Cave space, then, in the context of this essay, includes games that attempt to directly represent some sort of underground place. Cave-like spaces are the large number of spaces in games that feign representation of urban, built, or outdoor space, but, in fact, actually represent the characteristics of cave space.

While *Doom*, *Grand Theft Auto*, and *Minecraft* illustrate how games represent and sublimate cave-space, other examples from the margins of gaming show both direct and indirect influences. The three-dimensional visualization system called CAVE (a self-reflective acronym for "Cave Automatic Virtual Environment"), initially developed by the Electronic Visualization Lab at the University of Illinois and demonstrated at the 1992 SIGGRAPH,⁶ aptly invokes Plato's famous cave allegory (Book X of *The Republic*). The 2001 novel *Plowing the Dark*, by Richard Powers, describes the fictional development of a simulated environment called "Cavern," and features *Adventure* prominently. A Japanese arcade gaming developer chose the name "Cave Co., Ltd." A cave features strongly in a flashback sequence in the 2002 steampunk adventure game *Syberia*, by French gaming company Microids. In her dissertation on *Adventure*, Buckles examines the game as folk art, an approach that makes great sense when seen in light of the hacker aesthetic, which places great value on tinkering with, improving, and re-distributing code. For this reason, *Adventure* today exists in dozens of different formats, even while Crowther's original version was presumed lost for decades until it was retrieved from a backup of Wood's Stanford student email account (Jerz). The pseudo-graphic *Rogue*, which uses alphanumeric characters such as dashes and hash marks to represent the exploration and conquest of "The Dungeon of Doom," was created in the 1980's by programmers who were inspired by *Adventure*. One of the co-authors recalled the underground setting as being so obvious that it did not seem like a choice "because that was obviously where these structures would be. It is interesting that I never even questioned that or realized there were other choices ... even up until right now."⁷ Attracting much scholarly attention during the 90's was one particularly radical variation on the text-adventure format, the MUD (Multiple User Dungeon), a multi-user textual space created in 1979 by Roy Trubshaw and Richard Bartle. According to a timeline compiled by Koster, Trubshaw explains the "MUD" acronym thus: "I might have named it MUA after ADVENT(ure) [...] but a game called *Dungeon* [a mainframe adaptation of *Zork*] appeared and saved me from trying to find a way to say MUA without sounding silly." Later MUDs used object-oriented programming techniques, permitting the real-time manipulation of the database that creates the world, pushing MUDs out of the realm of cavespace towards the realm of the sandbox. In addition, also in 1979, the first in the 19-year series of Choose-Your-Own-Adventure Novels (a kind of print-based hypertext for juvenile readers) was Edward Packard and Paul Granger's *The Cave of Time*. While pulp adventure novels, comic books, and fantasy literature are among the other pop culture influences on videogames, the hitherto largely unnoticed effect of recreational caving is undeniable.

Cave as Leisure

One way to understand how the landscape can shape our gaming experiences is to look at how we turn our landscapes into places of leisure. In the Southwestern United States, nestled into the giant geological playground at the of southern end of New Mexico, sit two jewels in the necklace of America's National Parks: Carlsbad Caverns and White Sands National Monument. By almost any standard of natural beauty or sheer scale, Carlsbad and White Sands never fail to impress.

NOTE 6.

The Association for Computing Machinery's Special Interest Group on Computer Graphics and Interactive Techniques.

NOTE 7.

Michael Toy, in an e-mail to Jerz, 20 July 2005. Ellipsis in original; minor typos amended.

The Carlsbad Park was established, or more appropriately colonized, in 1923. The caves themselves emerged from a 250 million-year process that started as living reef in an ancient ocean. A world away from the “low crawl over cobbles” that greets a visitor just inside Crowther’s entrance to Colossal Cave, Carlsbad features modern developments such as a massive staircase and trail dropping down the mouth of the cave (replacing a rope and bucket), a 705 foot elevator shaft sunk from the desert floor into the massive cave system and, eventually, an underground cafeteria.⁸ Today, visitors can shop in an air-conditioned gift shop, view exhibits, or eat lunch in the park restaurant, before descending to walk the almost three miles of subterranean, black asphalt, hand-railed trail.

Spawned in the same primordial sea, White Sands’ sweeping 275 square miles of silky white gypsum has deposited for eons in wide, open Tularosa basin. The dune’s expanse is so great that it shows up as a milky blot on satellite photographs of the state.⁹ A small outpost welcomes guests off the highway and orients them in a well-worn visitor’s center. After a short, casual park ranger orientation, cars head out into the sand, following a short winding road to the heart of the dune. Despite their similarities in geography, as federal, natural treasures and destination landmarks for tourists all over the world, each place was crafted to serve a purpose.

At Carlsbad, a sonorous park ranger warns guests as they descend 75-story elevator shaft into the main cavern that they must stay on the trail and remain quiet. Touching a rock in the cave not only draws hundreds of dollars in fines, it can permanently taint or destroy what nature so painstakingly built. Walking in monastic solemnity, visitors take in the monumental glories of an underground empire carved by millennia of trickling water. Handrails guard every inch of the 2.75 miles of blacktop as it snakes from rock formation to vaulted room. Vast networks of lights illuminate stalactites, stalagmites, cones and columns with theatrical purpose, in a production orchestrated by scientists and park rangers. The freely tourable parts of the Carlsbad “show cave” are as well-orchestrated as a Disney Park and, in some sense, just as artificial.

At the White Sands, a road literally plowed through the sands gives visitors automotive access to the dune’s interior. Parking the family van on the soft shoulder of the rising sand, families open the doors and children race up the mounds. Plastic discs designed for snow sledding do double duty as teenagers schuss down the slopes. Squeals of laughter ring out across the rolling, desolate landscape. Here, the land is big, the forces of nature tireless and timeless.

In an effort to preserve the wild and wonderful places of America, the Park Service has circumscribed the land and constructed a codex of rules. But the rules change to suit the land. In Carlsbad the structures are as meticulous as a tax code. In White Sands, they are as carefree as a playground. But in both cases, they are boundaries set to ensure leisure as a product of the land. This dichotomy between fun found in unfettered play and that emerging from structured deprivation found a voice and terminology in Roger Caillois’ *Man, Play and Game*. His twin notions of *paidia* and *ludus* capture a distinction and a dualism that he saw in all forms of play. He saw the spirit of *paidia* as “diversion, turbulence, free improvisation, and carefree gaiety.” *Ludus*, on the other hand, stands “At the opposite extreme” (13). Laying Caillois’ notion onto the landscape of Southern New Mexico, we easily find the distinction in design between the cave’s park and the sand’s monument as essentially the distinction between *paidia* and *ludus*. In the sand, the visitor remains free to romp and roam and invent new diversions in the seemingly endless supply of crushed gypsum. In the cave, the viewer finds their pleasures inside the strict rules and dramatic wanderings of the path. In the sand, as in the “sandbox game,” freedom; in the cave, as in the “cave crawl,” restriction.

From this an obvious question emerges: is the experience of the cave fundamentally one of *ludus*? When Crowther summoned his subterranean adventures as a source for his revolutionary piece of entertainment software, did he bring back more than memories?

The second-largest cave in the world, Hoelloch Cave in Switzerland, is tilted at a 45 degree angle. In England, where caving typically involves climbing in and out of pits, the sport is called “potholing.” Crowther’s game, which involves not only descent but the traversal of distance underground, owes a great deal not only to the creative efforts of a particular computer-programming cave explorer, but the specific geological features of the particular cave that inspired him, together with Crowther’s understanding that his own game is part of “the longest cave.” To both cavers and gamers, a “room” is a discrete spatial region, the word expanding to include shapes that

NOTE 8.

Some of the details are found in the park brochure, “Cavern’s Chronology,” available online at <https://web.archive.org/web/20060501000000/http://www.carlsbadcave.com/chronology.html>

NOTE 9.

Dunes and Dreams: A History of White Sands National Monument. Available online at: <https://web.archive.org/web/20010617133751/http://www.dunesanddreams.com/>

seem, to the uninitiated, hardly room-like at all. Exploration, mapping, inventory management, resource-management, and party-based operations are all deeply embedded in the culture of amateur cavers.

The Environmental Composition of *Adventure*

The Crowther/Woods collaboration comprises four sequential gaming environments. While space does not permit a detailed “close playing” of *Adventure*, a brief analysis of the game’s structure illustrates the tensions among four different environments encountered by the player, as the cave is sought, entered, plundered, and ultimately deconstructed:

1. Above-ground realism. The small building, the most prominent feature in the opening screen of text, is an industrial reference point (identified as a pump-house) in an anonymous, endless forest. The forest implementation violates our notions of the standard Cartesian grid, in that the “rooms” are not symmetrically linked, camouflaging the fact that what the game text suggests is a boundless forest is really more cavespace.
2. Underground uncanny. Topography and geology create setting; interaction with animals sets ground rules, though a cheerful subterranean bird’s fear of a metal rod and the bird’s unexpected power over a hostile snake remain unexplained.
3. Liminal realm. While the cave retains solidity and integrity, Crowther’s dwarves and the appearance of the crystal bridge place us firmly in the realm of fantasy. In sequences added by Woods, a dragon, a troll, a friendly bear, and a hellish volcano participate in the natural/fantastic theme laid down by Crowther.
4. Framework and self-conscious conclusion. Woods’s contributions included fine-tuning and inventing features that established a stable gaming environment for the player to experience the cave. Lacking first-hand cave experience, when he needed to provide new content, Woods drew on his own experiences. The vending machine deep within a maze, announcements over a PA system, a system for reincarnating the player, and an endgame that features the cave “closing” all break the “fourth wall” in such a way as to emphasize the game as a software artifact.

Adventure succeeds in large part due to the depth and realism of the scenery, which is usually rendered in concise prose that calls interesting details to the reader’s attention, yet also leaves much to the imagination. Nelson analyzes the tension between Crowther’s austere fantasy vision and the isolated, often comical set pieces supplied by Woods. Graham Nelson notes that the tension between the contributions of Crowther and Woods is part of the game’s charm. “Stretching a point, you could say that there is a Crowther and a Woods in every designer, the one intent on recreating an experienced world, the other with a really neat puzzle which ought to fit somewhere” (345). Crowther’s intimate familiarity with the geography he was describing is evident in the understated, three-sentence description of the Orange River Room:

You are in a splendid chamber thirty feet high. The walls are frozen rivers of orange stone. An awkward canyon and a good passage exit from east and west sides of the chamber.

While the player is informed that the chamber is “splendid,” the text does not explicitly state what emotional effect the height of the chamber or the proximity of the “frozen rivers of orange stone” is supposed to have. We see this location through seasoned, critical eyes, which duly note the presence of geological wonders, but which then immediately evaluate the next possible move. This is the practice of viewing constraints and strategizing - as one does when exploring a cave. As it happens, the “awkward” exit from the Orange River Room is the way back to the surface, and the “good passage” leads deeper into the cave; the text subtly reinforces the exploratory premise of classic text adventures. Without clumsily announcing something like, “The west exit looks so intriguing that you can hardly wait to explore it,” the text subtly discourages the player’s premature exit.

By contrast, *Adventure* lavishes nine sentences on a description of the view of an active underground volcano, the heat and noise of which are described a few rooms away, which builds some anticipatory tension. The name of the location is presented as “Breath-Taking View,” and the description is mostly a list of geological wonders to support this claim: a “blood-red glare,” an “eerie, macabre appearance,” the “smell of brimstone,” and “sinister apparitions.”

By itself, each piece of scenery would have suitably established an appropriate atmosphere, yet the description continues thus:

To one side is a deep gorge, filled with a bizarre chaos of tortured rock which seems to have been crafted by the devil himself... The far right wall is aflame with an incandescence of its own, which lends an additional infernal splendor to the already hellish scene. A dark, forboding [sic] passage exits to the south.

As if this room offers yet another dynamic image to counter the stately effect of Crowther's "frozen rivers of orange stone," the volcano room features an "immense river of fire" that "crashes...burns... and plummets." No other room in the game is developed in this level of detail, so the long (223-word) description is a noteworthy event in the player's experience. While the Woods expansion of *Adventure* is not geologically or topographically consistent with Crowther's beginning, the addition of the "Breath Taking View" (which he co-wrote with John Gilbert, who discovered Crowther's original version first and told Woods about it),¹⁰ suggests that he was able to intuit what made the cave world different from the view on a mountaintop, and that he felt it necessary to re-configure his own part of the cave for the sake of the player's experience. Yet the reference to a "for[e]boding passage" is distracting. In the presence of the volcanic fury described in Breath-Taking View, what is it about any exit - even a dark one - that can possibly look threatening? The player's arrival at this room does not advance the plot, provide any character insights, or affect the game in any significant way (beyond offering the player a textual reward for having gotten past an obstacle on the path leading to the site). In terms of gameplay, the volcano room is a bit of a letdown, as is the exploration of that mysterious southern exit: it simply leads back out the way the player has just come. This underground encounter with the uncanny - an unexpected encounter with the familiar - participates in and reminds us of our own complex relationship with caves.

Fishwick, reminding us that the root meaning of "primitive" is "first," asserts that "[t]he more we study the past the more we realize it isn't really past. Instead, it is buried just under the surface, waiting to emerge and explode in the twinkling of an eye" (75). As T.S. Eliot put it, "Some one said: 'The dead writers are remote from us because we know so much more than they did' Precisely, and they are that which we know" (102). Yet, to complete the endgame written by Woods, the *Adventure* player must literally explode the conceit, reconfiguring a space heretofore treated as unconfigurable, destroying part of the virtual cave via a virtual dynamite blast.

Crowther's attitude towards game objects and the words used to describe them was minimalist. Like a caver on a long haul, or like the creatures inhabiting a real cave, Crowther's attitude acknowledges the frugality demanded by the caving environment. By contrast, Woods's endgame, like the synonym-saturated volcano room, celebrates an extravagant redundancy, most notably the room full of sleeping dwarves, bundles of magic rods, and other assorted props presumably intended to be deployed the next time the game is played. For Woods, whose computing environment required him to add code that limited access to the game during working hours, if the cave closed today, it would open again tomorrow; the dynamite blast also invites the player to think of the cave, too, as transient - something that exists only within the digital world of the computer.

Caves Before Adventure

Gregory Yob's 1972 game *Hunt the Wumpus* presents a very brief textual description of a cave (e.g. "YOU ARE IN ROOM 13 / TUNNELS LEAD TO 12 14 20"). The player is given a brief hint about hazards in nearby rooms (e.g. "I FEEL A DRAFT" indicates that one of the tunnels has a pit, which will swallow up the player, and "I SMELL A WUMPUS" means the monster is nearby) and is invited to "SHOOT OR MOVE (S-M)?" Gameplay involves mapping out the hazards in the network, determining where the monster is, and shooting an arrow into the proper tunnel (e.g. by typing "S" and then "12"). In a short humorous article on his own game, Yob reasons that, because the motion of the titular creature isn't affected by hazards such as pits, the creature must have suction feet. It must likewise be too heavy to be carried off by bats. Such a detail is not explicit in the gameplay itself, nor does it give the player any advantage, but it forms a kind of mythology that justifies the rules, and is therefore an extension of Yob's creative energies. Of the computer games in wide general circulation in the early 70's, *Hunt the Wumpus* is unique for its first-person perspective: the player inhabits a single

NOTE 10.

As explained through numerous e-mails Jerz exchanged with Gilbert and Woods, from April to July of 2005.

room, while similar hide-and-seek games from the same era present the player with a top-down grid. The appeal to multiple senses may intensify the player's collaboration in creating that world. What Coleridge calls a "willing suspension of disbelief," human-computer interface (HCI) specialists call the "ELIZA effect." This game, which featured cave-exploration, map-making, and combat, might have made some impression on Crowther.

Due to the physical complexity of the non-Cartesian game-space, *Hunt the Wumpus* completely dispenses with visual representations. All action or changes in the game state are represented by textual messages; for instance, if a cave adjacent to the player's position contains a hazard, the computer displays a general warning such as "I SMELL A WUMPUS," but the player is not told which tunnel leads to the threat. The prose descriptions offer appealing embellishments, such as drafts signaling nearby pits, and of course the smell of wumpus. These sensory details spark the imagination in the way that other computer games of the era (such as "Battleship" or checkers) do not. Once Yob had made the decision to rely upon text, presumably out of necessity (owing to the limitations of computer hardware of the era), those textual messages invited later hackers to embellish the relationship, developing a mildly patronizing, dryly adversarial tone for the narrator, and in the process, giving the wumpus something resembling a personality, and enlivens what might otherwise have been another tedious guessing game. The narrator uses the first person when communicating the status of the game world ("I SMELL A WUMPUS"), and the second person when describing the results of player actions ("YOU HAVE FALLEN INTO A PIT"). Citing Brucker and Watson's observation that caving, a deeply sensual sport, is "tactile in a way that no other contact with the inanimate can be," Chang posits that "*Adventure* grants its player the caver's quasi-mystical relationship to the nonhuman environment, bringing her into meaningful proximity with often overlooked inorganic actors and the humbling scale of geologic time" (14). While the environment of *Hunt the Wumpus* was much starker than that of *Adventure*, we can spot even at its early stage a tension between those elements which emphasize the function of the program as a game, and those elements that help develop a story (a tension that would be played out, to some excess, in the "ludology vs narratology" debates during the early 2000s).

What surprises, and perhaps remains another unexplored connection in the labyrinth of games as caves, is how many game designers, Yob included, have come to the cave metaphor as a solution to a game design problem. Because *Wumpus* predates *Adventure*, the issue of influence is gone. Yob did not need the experience of the cave to reason that a cave space was a suitable game space. The nature of the cave - perhaps as a mythical environment or popular culture notion - was enough to allow Yob to connect the non-configurability and limited sense perception he required for *Wumpus*.

Going Deeper

Do video games reflect an influence of caves? Almost certainly. Thanks to Crowther, caves will be forever linked to the early development of the form. Further, caves, as a form of psychological symbol, would have surely found their place in the narrative structure of games. Dropping down into a cave is about leaving the familiar, surface world. Save for rare examples of the harvesting of bat guano or the occasional rescue operation, there is little practical reason to delve deeply into the maw of naturally existing caverns. Still, people dream about caves, wonder about caves, and finally one day charge head-first into the blackness that lurks just beyond the reach of their shiny brass lanterns.

About every other month, the Cave Research Foundation sponsors expeditions in the Mammoth Cave System. In July of 2005, the CRF organized two trips into the Bedquilt entrance of Colossal Cave, in order to photograph artifacts such as an old axe, an iron rod, and antique batteries - all of which are mentioned in the game. On July 6, a team led by Elizabeth Winkler, with members Roger Brucker (co-author of *The Longest Cave*), Lynn Brucker, and Dennis G. Jerz, failed to locate the cave entrance (a common occurrence known as "taking the Bedquilt rinky-dink"), and returned to camp. The next day, however, a second expedition led by Dave West succeeded.

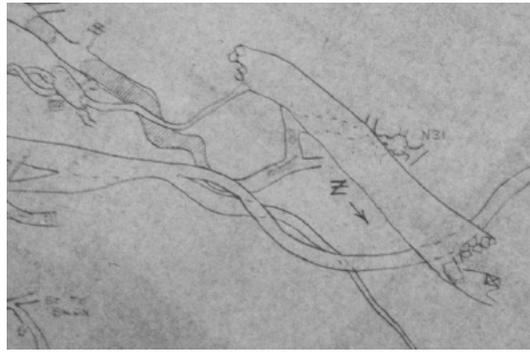


Figure 3: Detail from Will and Patricia Crowther's survey of the Bedquilt area of Colossal Cave. Copyright 1975, Cave Research Foundation.

The "X" in the lower right is the cave entrance, set into a large concrete structure that has since been removed. The large rectangular region is what Crowther called the "low crawl over cobbles," which leads to the "debris room," which is the pointy upper end of the cobble crawl. The narrow passage sloping down and to the left is the "Awkward sloping E/W Canyon," which twists several times as it approaches the bean-shaped "Bird Chamber." According to cartographical convention, north is up. In the game, Crowther placed these rooms on a straight east-west line (see Figure 1).

As a volunteer cartographer with the Cave Research Foundation in the early 70's, Will Crowther wrote software to assist in the process of recording and displaying survey data. Caves are mapped by teams of surveyors who measure the distance and angle that separates key points along a route. The route is anchored to one or more points whose location in 3D space is known, and loops around to test its own accuracy. When exploring unknown regions, cavers carry sketchbooks where they record information about the topography, such as cross-sections of passages, and changes in ceiling or floor height. Once the survey points have been mapped, the additional details are sketched in (see Figure 3, above), much as a forensic artist might sketch flesh over a skeleton. Both the survey map and the original version of *Adventure* represented Crowther's intellectual efforts to present information about the Bedquilt region of Colossal Cave in a useful manner, yet the map and the game were separate activities, not overlapping in methodology or time. The game's textual description of about 25 distinct regions ("rooms") of varied shapes and sizes correspond to recognizable parts of the real cave. Of particular note on the map is the large sloping rectangular region, which visually represents what Crowther called the "low crawl over cobbles" (pictured in Figure 4).



Figure 4: Crowther's no-nonsense description of this room is efficient and accurate: "You are crawling over cobbles in a low passage." While the game does not specify that the crawl extends for about 300 feet, the present progressive tense ("are crawling") accurately suggests an activity with some duration. Photo by Lynn Brucker, © Cave Research Foundation 2005. Reproduced by permission.

While writing on the walls is forbidden in modern caving practice, the caves do bear the markings of countless previous explorers. The "XYZZY" is a feature Crowther added to his version of the debris room - no such marking appears in the real cave. The map (Figure 3) depicts a narrow passage leaving the debris room, leading down and to the left. In the game, Crowther called this "an awkward sloping east/west canyon," a term which may be misleading

to those who are not familiar with caver jargon: a “canyon” is any room that is taller than it is wide. The passage is now almost a belly crawl, the bottom having filled up with silt. The passage leads towards an oval room that Crowther called the “bird chamber,” “a splendid chamber thirty feet high” whose “walls are frozen rivers of orange stone.”

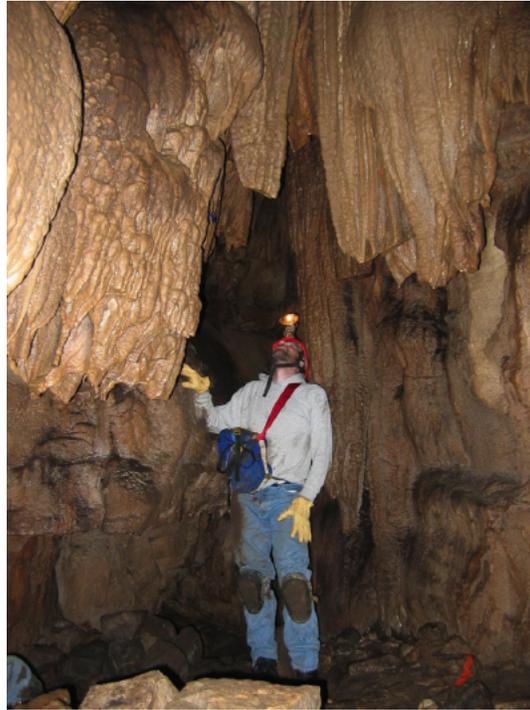


Figure 5: “You are in a splendid chamber thirty feet high. The walls are frozen rivers of orange stone.” Dennis G. Jerz, with a shiny brass lantern on his helmet, examines the “Bird Chamber” in the Bedquilt region of Mammoth Cave, Kentucky. Photograph by Lynn Brucker. © Cave Research Foundation, 2005. Reproduced with permission.

Deeper in the cave, accessible from the Hall of Mists via a ledge six feet off the ground - just as the game describes it - is perhaps the most famous (and hated) location in the game.



Figure 6: “You are in a maze of twisty little passages, all alike.” Dave West points out one of the many ways to get lost in the cave that inspired the classic computer game *Adventure*. Photograph by Dennis G. Jerz. © Cave Research Foundation, 2005. Reproduced by permission.

In a 1990 Cave Research Foundation newsletter, Mel Park wrote of the Crowther and Woods collaboration:

In the cave, as in the game, the proper way to the Hall is through a flat entrance room; “You are crawling over cobbles in a low passage” through an “awkward sloping east/ west canyon” to the room whose walls are “frozen rivers of orange stone”, and on to the “Hall of Mists” (1871 Passage), then down to the Hall of the Mountain King. (Park 7)

While Woods is sometimes credited for turning Crowther’s abandoned map into a game, Crowther’s geological accuracy should not detract our attention

from the many familiar game elements that he combined in the same piece of software for the first time, such as inventory objects, puzzles, magic, a maze, combat, and player death and resurrection. The text parser and dry narrative humor are not as common in today's games, but they were standard elements of games through the 1980's and were still recognizable during the early 1990's.

After eating lunch in the Hall of Mists, and photographing 17 of the rooms that appear in the game, the CRF party reached the room *Adventure* calls "Brink of climbable pit." The other CRF members surprised Jerz - a first-time caver - by asking him to lead the party out.

"I've spent enough time around you to get to know your sense of humor," Jerz said. "That was a good one."

An awkward silence followed.

Nobody made any attempt to move until Jerz finally began retracing his steps.

A few steps behind Jerz, West, the team leader, hesitated at a junction. "You'll notice I'm not following you anymore," he said, prompting Jerz to backtrack and pick another tunnel. After a few more similar false starts, Jerz finally realized that the proper direction from that junction was straight up - a dimensional realization that echoes the discovery of the hidden subway system in *Grand Theft Auto III* or the realization that the network of caves in *Hunt the Wumpus* is a geometric solid that loops around itself.

Later that night, Jerz made further connections during an ad-hoc three-hour games studies seminar at the CRF's Hamilton Valley research facility. Both caving and scholarship can be political. Passages that have been identified but not explored are carefully noted on surveys, and the finder of a new path generally expects to return, leading an expedition that might lead to "virgin cave" - a term fraught with Freudian and postcolonial implications. If given the choice, a serious caver might prefer to follow a passage that leads away from park-controlled land, thus potentially giving the federal government the incentive to expand the boundaries of the park. Yet the CRF's relationship with the National Park Service is complex. According to caver Mel Park, "Colossal and Bedquilt caves were developed by the Louisville & Nashville Railroad to attract tourists, in a process that was tumultuous for a few Flint Ridge landowners" in the late 1890s (Park 7). Ownership and monetization were thus an important part of the backstory behind the formation of the national park that now oversees the site. Jerz met several CRF members who expressed no objections to using dynamite in order to gain access to unexplored tunnels, although a preservational mindset and post-9/11 concerns makes the authorities less likely to be enthusiastic about such activity. Above ground, the CRF has organized efforts to fight development that threatens the park's caves - even when the developer is the National Park Service.

At the daily briefing the morning after the 2005 Bedquilt expedition, Roger Brucker, past president of the CRF, whose caving career spans some six decades, stood up to announce that, after getting a crash course in the academic study of computer games, he, too, had had a revelation.

As old players retire, new players re-survey the old routes, optimizing and perfecting their traversal of difficult terrain. Roger's son Tom, who had surveyed Bedquilt with the Crowthers in the 1970's, became excited by the possibility that one might return to the cave with a PDA and a compass, and try to use the game in order to navigate through the real cave. Tom's teenaged son Nathan, who played only DOS-based computer games until he was 11, had raced through most of *Adventure* at lightning speed, and translated effortlessly between the cavers struggling with the terminology of gaming, and the games researcher struggling with the terminology of caving. Recalling the delays between the acquisition of survey data and their integration into computer generated maps during Crowther's era, Brucker expressed wonder that the Bedquilt party was able to take scores of digital pictures and present them for analysis just hours after emerging from the cave. "The days of bringing nothing but maps out of the caves are over," he said. The collaborative effort to explore, survey, map, and protect the Mammoth Cave System has been, Brucker told the assembled cavers, a grand multi-player game.

Around the breakfast table, heads nodded.

Just as Will Crowther had created *Adventure* in order to share his love of caving with his daughters, thirty years later the game was still uniting the

generations and helping to preserve the culture and ethos of caving, furthering the grand efforts of the Cave Research Foundation and its joint venturers.

One of the nodding heads belonged to Sue Haggen, whose bright orange clogs typify the casual, homey atmosphere at the CRF camp. From the back of the room, she voiced her approval: "So let's play!"

These points - of the inevitability and the historical importance of caves to games - stand on either side of a more interesting, and potentially practical realization - the reflexive relationship between cave as game, and game as cave. In this view, the game designer becomes a cave explorer of imaginative worlds. The world exists in the darkness of unfulfilled dreams. But with each reach out into the darkness, the game takes shape. The rules form the walls of the space. And a mythical place becomes clear. The players, following later, retrace these initial explorations, bringing with them the pigments of their own imaginations, chalking lines on the walls and illustrating their own adventures. In this view, the cave as metaphor bridges our interest and perhaps even our respect for the natural into the imaginative and artificial. Here, we understand that all impulses start in the environment and become the raw material of human fantasy and desire.

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