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## The Long Zoom

By STEVEN JOHNSON

### Correction Appended

Most eras have distinct “ways of seeing” that end up defining the period in retrospect: the fixed perspective of Renaissance art, the scattered collages of Cubism, the rapid-fire cuts introduced by MTV and the channel-surfing of the 80’s. Our own defining view is what you might call the long zoom: the satellites tracking in on license-plate numbers in the spy movies; the Google maps in which a few clicks take you from a view of an entire region to the roof of your house; the opening shot in “Fight Club” that pulls out from Edward Norton’s synapses all the way to his quivering face as he stares into the muzzle of a revolver; the fractal geometry of chaos theory in which each new scale reveals endless complexity. And this is not just a way of seeing but also a way of thinking: moving conceptually from the scale of DNA to the scale of personality all the way up to social movements and politics — and back again.

It is, by any measure, a difficult way of thinking, in part because our brains did not evolve tools to perceive or intuitively understand the scales of microbes or galaxies. You can catch glimpses of the long zoom in special-effects sequences, but to understand the connections between those different scales, to understand our place in the universe of the very large and the very small, you have to take another way in. To date, books and documentaries have done the best job of making the long zoom meaningful to mass audiences, starting with Charles and Ray Eames’s proto-long-zoom “Powers of Ten” documentary of the 70’s, which took the viewer from the outer cosmos to the atoms spinning in the hand of a man lying by the lake in Chicago. But a decade or two from now, when we look back at this period, it is more likely that the work that will fix the long zoom in the popular imagination will be neither a movie nor a book nor anything associated with the cultural products that dominated the 20th century. It will be a computer game.

The designer of the game happens to be both the most famous and most critically acclaimed designer in the young medium’s history: Will Wright, the 46-year-old creator of the blockbuster hits SimCity and the Sims. When I visited with Wright recently, he was sitting in a greenhouselike office on the roof of an anonymous-looking complex in Emeryville, Calif., a few miles west of Oakland, where his studio is based. For the first few minutes of our meeting, Wright was having trouble with the atmosphere of the game, which is called Spore. He was trying to explain how some players will be able to create entire galaxies populated by artificial life forms when the game is introduced sometime late next year. He had pulled up the highest level of Spore — where the player gets to create and colonize a new planet — to demonstrate the way in which the game simulates the complex dynamics of ecosystems and food webs. But before he could colonize the planet, he had to cultivate an environment hospitable to life by heating up the surface or cooling it down and by adding moisture. Unfortunately, Spore’s planetary simulator --- like our own atmosphere — is

vulnerable to the inconvenient truths of runaway feedback loops; as Wright added a little heat to his planet, it quickly spiraled into a molten fireball. And so our conversation lurched to a halt as Wright tried to get the right balance.

“O.K., now we’re finally cooling off,” he said, clicking furiously on his computer screen. “The temperature’s going down, so we can get more water in here. Oh, now we’ve got way too much atmosphere.” While adjusting the planet, he paused long enough to say: “It’s kind of like that labyrinth game where you’re rolling the ball around the maze, trying to drop it in the hole. Except we’ve got these inertial effects, where your planet starts heating up, and you’re trying to slow it down, but you get these runaway greenhouse effects.” He turned back to the screen. “O.K., our temperature’s pretty good; our atmosphere’s pretty good. Now let’s see if we can add water.”

This atmospheric balancing act is emblematic of Wright’s whole career: hitting that elusive sweet spot between difficulty and accessibility, between highbrow concepts and lowbrow diversion. If he can get the atmosphere-building tool to work, it could be both an addictive game-play element and, at the same time, a hands-on lesson in the dynamics of atmospheric systems. The challenge here is, ultimately, a smaller version of the larger challenge that faces Spore. No one doubts that the game will be the most ambitious work in the history of this new medium, whenever it is released. But for it to succeed as a game, it can’t just be complex. It also has to be fun.

If anyone can pull it off, it’s Will Wright. This is the guy who made the urban planning simulation SimCity into one of the all-time top-selling games in history. There is probably no one alive who has a comparable track record of combining arcane scientific theories and compulsively addictive entertainment.

But even Wright hasn’t tried to simulate an entire universe before.

I got a first glimpse of Spore six years ago, when I visited Wright to talk to him about the Sims Online, the networked version of the massive international hit, the Sims. We talked about the Sims Online and his general design philosophy for an hour or so, and then he cut off our conversation abruptly and said, “Let me show you something else that I’m really excited about — but you can’t write about it yet.” He then proceeded to show me a sequence of animations that looked, to my eyes at least, like the trip-out special-effects sequence at the end of “2001.” I had no idea what I was even looking at. It wasn’t at all clear where the game was or if it was a game at all.

Spore has progressed mightily over the past six years — an eternity in game-development time — though an official start date has yet to be set by its producer, Electronic Arts, the world’s largest game maker. “What you’re doing in Spore is layer by layer creating an entire world that at the end of the day is entirely yours: the creatures, the vehicles, the cities, the planets,” Wright explained. Those layers map onto different spatial scales that you advance through as you play: cell, creature, tribe, city, civilization and space. (As in most traditional games, once you have completed a level, you can always go back to it. A skilled gamer might be able to reach the highest level after 30 hours of play, but like all of Wright’s creations, the game has no definite ending.) As you begin playing Spore, you take on the role of a single-celled organism, swimming in a sea of nutrients and tiny predators. This part of the game has a streamlined, 2-D look that harks back to classic games from the 80’s like PacMan. Once you have accumulated enough “DNA points” or

“evolutionary credits,” you acquire the use of a feature called the “creature editor,” and things start to get really interesting. You assemble a new life form to represent yourself using an almost comically intuitive tool. If you have the technical chops to assemble a Mr. Potato Head, you can build a creature in Spore. You start with a basic body type wrapped around a standard skeleton, and then you can pretty much do whatever you want to it: stretch it out, condense it, add seven asymmetrical legs and one pincer, give it eyes on both sides of its head or wrap a polka-dot skin texture around it. I’ve seen creatures designed as exact replicas of the Care Bears, and I’ve seen creatures that look like H.R. Giger’s sketches for “Alien.”

Once you have assembled your creature, you deposit it in a functioning ecosystem, a computer-generated world populated by plants, food, water, weather, predators and prey. At first you guide a single creature, instructing it to forage, hunt, drink, sleep, mate; your strategy evolves depending on the needs of your creature and the opportunities and threats presented by the environment. As you struggle your way through this early stage, you earn more DNA points that allow you to add new attributes to your creature — like humanlike intelligence — and eventually graduate to the next level, where you control a group of creatures that form a primitive tribe, augmented by simple tools. (Wright showed me a tribe bonding around a campfire, playing drums and dancing, before heading out for a communal hunting expedition.) At this point, the player moves from questions of basic metabolism to social dynamics: Is your tribe a band of warriors or a peace-loving commune? Is it intent on exploiting new technologies? Or does it focus on low-tech social camaraderie?

When your tribe has reached a sufficient level of sophistication, it will begin to form cities, and the player shifts to issues of trade and commerce or constructing roads and buildings. All the while, decisions made at earlier stages of the game continue to shape the current stage: adopting a carnivorous lifestyle in the creature stage changes the activities available to your subsequent tribe; a tribe of warriors will have a harder time building alliances with other cities when it reaches that stage. Eventually, you ascend to a United Nations-like perspective as you try to unify an entire planet divided between rival civilizations. Once you successfully pass from the “clash of civilizations” stage to the “end of history,” the game grants you that ultimate in Hegelian rewards: a spaceship. And then you’re off terraforming other planets and exploring an entire universe teeming with Spore life.

The different levels of Spore call for radically different styles of game play, each a subtle tribute to a canonical game of the past that influenced Wright. There is an elegance to those allusions, but as a game design strategy, it’s a risky move; most games don’t force you to juggle different genres. “When I looked at each scale,” Wright said, “the game play just seemed kind of natural to me: at the cellular level, you’d be PacMan; at the city level, it’d be Populous. I was worried about that, because mixed-genre games don’t do that well. But eventually we just decided to break the rules, and the genres would just be a kind of landmark that the players would recognize.”

To date, Wright has publicly demonstrated Spore on four occasions. Three of them were major game-industry conferences, all of which have triggered a frenzy of online analysis and debate. (Video clips of those demos have been downloaded hundreds of thousands of times on YouTube.) But for people who still think of game design as the province of nerds and arrested adolescents, Wright’s most striking public demo came earlier this summer in San Francisco during an onstage conversation with the musician and artist Brian Eno in front of a thousand rapt fans gathered at the Herbst Theater. The two men riffed

comfortably onstage, talking about “generative” art that evolves in unpredictable ways, often determined by the audience and not the original creator. Eno played one or two examples of his generative compositions, and Wright showed off a few levels of Spore.

“We’ve both been working on similar lines,” Eno said recently on the phone from his Notting Hill studio when I asked him about the connections between his work and Wright’s, “and I suppose we’ve converged. Instead of making fixed definitive things that we put out into the world, I think we’ve both decided that it’s much more interesting to make things that even we can’t predict.”

One explanation for the widespread interest in Spore is the gaming industry’s recent troubles. Sales have been uneven, and the best-seller lists are stacked with franchise hits, games whose basic conventions were established years ago, like the Madden football series, the controversial Grand Theft Auto titles and Wright’s own Sims franchise, which has thus far spun off more than a dozen sequels and expansion packs. When you factor in the moral panics over violent gaming emanating from Washington, it makes for a somewhat depressing time to be a game developer. Spore promises an escape from this bleak present: the game itself is about as violent as a cartoon version of Animal Planet, which should come as welcome relief for an industry tired of public attacks on Grand Theft Auto as a corrupter of youth.

Another factor in the hype is Wright’s extraordinary track record. His original breakthrough game, SimCity, released in 1989, helped inaugurate an entire genre of gaming: the “god game,” in which the player supervises a bustling and multifaceted system, managing resources, juggling different objectives. Visit the racks at a game store and you’ll see dozens of titles that descend from Wright’s original design for SimCity, games that let you manage a railroad empire or an amusement park or a zoo. (There are at least three games currently on the market that let you recreate Ancient Rome.) The Sims — released in 2000 — narrowed the god-game vista to the realm of the living room and the neighborhood. It went on to become the best-selling PC game of all time, in part because it attracted an unusual number of female players. Instead of allowing you to create the civic infrastructure for a vast metropolis, the Sims let players explore the more quotidian decision-making of home economics: paying the bills, buying furniture and appliances, cooking dinner for the kids. It is one of the resounding paradoxes of the game industry that its all-time best seller consists largely of performing household chores.

The sales history for the Sims is, of course, part of the reason that so many people are following Spore so closely. Since its introduction, more than 70 million copies of the original game and its spinoffs have been sold, generating \$1.6 billion in sales. (The biggest Hollywood moneymaker of all-time, “Titanic,” grossed \$1.8 billion worldwide.)

But Spore — which will reportedly cost about \$20 million to develop — promises to be more than just a blockbuster diversion. As Wright’s appearance with Eno suggests, the game perhaps deserves to be seen as a work of art first and foremost, a way of seeing and making sense of the world. If it succeeds, it may be in part because of the way its long-zoom perspective resonates with this particular moment in time. “I don’t know if we’re thinking about ‘powers of 10’ more, but we definitely bump into that perspective now in all kinds of cultural contexts,” says the game designer Ralph Koster, who wrote one of the best books to date about games and culture, “A Theory of Fun.” “But Will has definitely been thinking about it. There was always something powers-of-10-ish about SimCity. And way, way back in SimEarth” — Wright’s 1990 game

— “there was a window that would pop up and say, ‘This key reserved for future expansion for putting your SimCity into your SimEarth.’”

“It’s funny how many people, average people who aren’t science buffs or hard-core gamers, get the elegance of the theme — the powers of 10 idea,” Wright told me in his Emeryville office, having finally given up on creating a viable atmosphere. “Everybody has a different take on it: for some people, it has a religious theme; for others, it’s awe at nature and science. But everybody seems to understand that it’s a valuable perspective, and it’s a perspective that they like to have. In a way, what I’m trying to do is connect the almost inconceivable universal scale to the deeply personal, because what you do in the game is deeply personal.”

The long-zoom perspective is one of the key ways in which Wright’s work dovetails with Eno’s. Their talk in San Francisco was sponsored by the Long Now Foundation, an organization created to facilitate thinking on immense temporal scales: a thousand years or beyond. (The “long now” is a coinage of Eno’s, and the group’s most famous project to date is the Clock of the Long Now, an engineering marvel designed to keep time for thousands of years.) “One of the things that’s obviously been happening for the past 100 or 200 years,” Eno told me, “is that the range of our experience has greatly expanded: we can see much smaller things and much bigger things than we ever could before. But we can also start thinking about much longer futures and much deeper pasts as well. That really makes a big difference to us as humans, because on the one hand it makes us realize that we’re very powerful in that we’re able to comprehend and see all of this universe. But it also makes us seem so much less significant. We’re a tiny blip on a tiny radar screen. I think this is a feeling that people are trying to come to terms with, the feeling of where do we fit in all of this.”

And arguably the best way to come to terms with that feeling is to explore those different scales of experience directly, to move from the near-invisible realm of microbes to the vast distances of galaxies. Of all the forms of culture available to us today, games may well be the most effective at conveying that elusive perspective, precisely because they are so immersive and participatory and because their design can be so open-ended. “I wanted to make a game that would recreate a drug induced epiphany,” Wright told me. “I want people to be able to step back five steps, five really big steps. To think about life itself and its potential galactic-scale impact. I want the gamers to have this awesome perspective handed to them in a game. And then let them decide how to interpret it.”

The idea of a video game’s tackling such complex subject matter may strike some readers as surprising, but in truth staggeringly complex games have long appeared prominently on the gaming best-seller lists. One of the most lucrative franchises in the history of computer games is the Civilization series, which lets players recreate the entire course of human economic and technological history, experimenting with different political and legal systems, exploring alternate time lines of scientific development. The collaborative worlds of hugely popular, networked online games like World of Warcraft have evolved entire economies and social systems that mimic the complexity of small nation-states in the real world. Spore may be more ambitious in scope than these games, but its two most important innovations lie elsewhere: in its system for generating user-created creatures and in the way it allows players to share their creations with others.

Conventional game development follows a predictable pattern: the game designers decide which objects and characters will inhabit the world of the game, and then animators create computer models for those objects

and characters, which are then inserted into a game in a fixed state — an animation of Tiger Woods swinging a golf club or James Bond reaching for a gun or a character in the Sims taking out the trash. But Spore's open-ended approach to creature design fundamentally broke that system. Before I met with Wright, Spore's executive producer, Lucy Bradshaw, gave me a tour of the Spore studio and introduced me to a barefoot, speed-talking "technology fellow" named Chris Hecker, who had helped develop Spore's unique animation system. Hecker had a perfect one-liner for the technical hurdles the team faced: "The question is, How do you do animations for things you've never seen before?"

The solution Wright and his team hit upon revolves around something called "procedural animation," a way for the game designer to model certain key behaviors — walk, run, grab, fight — without necessarily knowing anything about the basic body type of the creature itself. If you design a creature with five legs asymmetrically scattered around its body, the Spore animation engine will figure out how such a creature would walk. To demonstrate the adaptability of the system, Hecker pulled up a collection of a dozen Spore creatures on his monitor, each with a strikingly distinct body architecture. The initial image was comical enough: it looked as if the bizarre Cambrian-era fossils that Stephen Jay Gould wrote about in "Wonderful Life" had been reassembled for a police lineup. Some looked like slugs, some like spiders, some like extras from "Where the Wild Things Are."

And then Hecker hit a key, and they all, miraculously, did a back flip, each in its own decidedly idiosyncratic way.

But surely, I asked, given the open-ended, no-two-creatures-alike nature of the editor, there are going to be some creatures that have body types that won't perform certain actions? Hecker and Bradshaw nodded emphatically. They know that a certain percentage of their users will be building creatures deliberately designed to foil the procedural animation system. Those creatures won't likely be "fit" in a traditional evolutionary sense, in that they will be less skilled at collecting food or avoiding predators. But they will be perversely satisfying to players keen on exploring the boundaries of the Spore architecture. Hecker pulled up a new lineup to demonstrate a clapping animation that included a creature whose cranium is so inconveniently located that clapping forces him to slap both his hands against the side of his head. It looked like slapstick comedy of the highest order — vaudeville meets "Monsters, Inc."

"Our philosophy is," Bradshaw said, "if it's going to break, it should break funny."

The procedural approach has another fringe benefit, one that helped bring about Spore's other major innovation. Characters and objects can be compressed down to incredibly small files. An entire planet in Spore — teeming with plants, weather and creatures — takes up about 80K of memory. By comparison, a typical song on your iPod is about 50 times larger. You could download an entire galaxy of Spore planets before you could download all the tracks on "Dark Side of the Moon."

That small file size is crucial to the way the game allows players to share their creations with other players in the Spore universe. As you work your way through the Spore levels, your creatures are automatically sent back to the central Spore file servers, where they are then used to populate the worlds of other players. This approach was directly inspired by Freeman Dyson's notion of Panspermia — the idea that life on earth may have been seeded via meteors carrying microscopic "spores" of life from other planets. (Dyson's concept is

also the origin of the game's title.) When you land on a new planet in the game's final stage, it may be teeming with multiple exotic species, all of whom have evolved separately on other computers around the world, guided by the tastes and imagination of complete strangers. But these creatures will, crucially, have lives of their own once they have found their ways onto your machine. They will not be controlled by other players as you interact with them on your screen. Once they have migrated to your computer, they will act autonomously, based on the procedural animation and artificial-intelligence algorithms of the Spore software. By the same token, the creatures that you have lovingly brought to life will spread throughout the alternate universes of other Spore players, struggling for existence on their own, independent from your direct control.

In this respect, Spore breaks decisively from the fastest-growing genre in gaming today: the so-called massively multiplayer networked games — like World of Warcraft — where thousands of players share a single persistent virtual world, interacting with other players via their onscreen characters. (Interestingly, Wright's only foray into massively multiplayer design — the online version of the Sims that launched in 2002 — was a flop.) When you visit a bustling town center in a multiplayer game and see hundreds of characters sharing the space, you are intensely aware that each of these onscreen characters is being controlled from moment to moment by a live, sentient human somewhere in the real world. The social element is very much in the foreground of the experience. Spore flips that model on its head. Instead of a single shared world with millions of active participants, Spore promises a million alternate worlds, each occupied by a single player. You will meet creatures invented by others, but ultimately you are alone in your own private universe. Wright calls Spore “massively single player.”

It remains an open question whether this model will take hold with today's players, who are increasingly used to the social dimension of online play. “I'm obviously biased toward the online worlds,” Koster said, “but the fact that I'll never encounter someone else's galactic empire that actually has some human brain behind it depresses me a little, because that would be awfully cool — especially with the scope and scale we're talking about with Spore.”

When you visit the Spore studio in Emeryville, the largest open room looks, at first glance, like a standard well-financed Bay Area software company: the double-height loft-ceilings, the bean-bag chairs slung around an oversize monitor, the barefoot employees. But the art strung up on the walls suggests that something different is being concocted here. There are beautiful renderings of imagined Spore planets that demonstrate the range of aesthetics possible in the game: a lush, organic world called Shittake Moon; a surreal globe called Crabelaw with landmasses shaped like giant crustaceans. Everyone's desk is populated by plastic action figures of Spore creatures, manufactured in-house by Wright's employees using a 3-D printer that can generate a physical toy in a matter of minutes from a computer model. (Electronic Arts is investigating the possibility of selling customized Spore critters in toy stores as a side business.)

As Bradshaw, the executive producer, gave me a tour of the office, I found myself being reminded of something, but for a few minutes I couldn't quite put my finger on it. And then it hit me: the general feel of the place reminded me of my son's kindergarten classroom, with its walls covered with renderings of imaginary worlds and creatures and its shelves filled with toys designed to teach and entertain at the same time.

When we finally made it up to his office, I asked Wright about the educational side of his game. “The big underlying theme is creativity,” he said. “We want to prove to the players that they can make these really cool things that they never thought they could make. It’s the computer as an amplifier of your imagination.” Like all of Wright’s games, *Spore* is likely to attract a broad range of age groups. A tech-savvy 7-year-old could easily obsess over the game, as could a mid-50’s reader of Jared Diamond or E.O. Wilson.

Of course, some of the content of *Spore* is fanciful. The “DNA points” that players accumulate have no real-world analogue, for instance, and thus far no one — that we know of — has been able to grow a life-sustaining environment on a lifeless planet. “I’ve had a few people ask me if I think *Spore* will help teach evolution,” Wright said, “and the ironic thing is that, if anything, we’re teaching intelligent design. I’ve seen a few games that relied on evolution — I’ve even designed some of them — and it’s just not as fun.” But, of course, there’s one crucial way in which *Spore* breaks from intelligent design. The universe of the game is not dominated by a single, all-powerful creator. It’s a universe governed by a million intelligent designers, each unleashing his or her creations to be fruitful and multiply, to conquer and befriend, to fly spaceships and fashion planets.

Despite the fictions, many of the themes of *Spore* are immensely valuable ones, particularly in an age of environmental crisis: the fragility of life, the connection between micro- and macro- scales, the complex networks of ecosystems and food webs, the impact of new technology on social systems. *Spore*’s players will get to experience firsthand how choices made on a local scale — a single creature’s decision to, say, adopt an omnivorous lifestyle — can end up having global repercussions. They will detect similarities between one level of the game and another, the complex balancing act of global trade mirroring the complex balancing act of building a sustainable environment. And traveling through a simulated universe, from cells to constellations, will, ideally, make them more curious about the real-world universe they already inhabit — and show them that they have the power to shape that universe as well.

“What’s very interesting about games,” Eno said, “is that they let you begin thinking about possibilities when you’re young enough to incorporate them into your life. So I think a game that says to people, You can make things that then have independent lives, that’s already quite an amazing idea. And then these things can interact with other people’s objects — that’s quite a grown-up idea.”

It occurred to me as I wandered through the halls of the *Spore* offices that a troubled school system could probably do far worse than to devote an entire, say, fourth-grade year to playing *Spore*. The kids would get a valuable perspective on their universe; they would learn technical skills and exercise their imaginations at the same time; they would learn about the responsibility that comes from creating independent life. And no doubt you would have to drag them out of the classrooms at the end of the day. When I mentioned this to Eno, he immediately chimed in agreement. “I thought the same thing,” he said. “If you really want to reinvent education, look at games. They fold everything in: history, sociology, anthropology, chemistry — you can piggyback everything on it.

“But my wife made a good point when I was talking about this the other day. She says it’s important for kids to do boring things too. Because if you can find excitement in something boring, then you’re set up for life. Whereas if you constantly need entertainment, you might have a problem, because life is full of things that aren’t entertaining. So I think I’d have three days of *Spore* and two days of obligatory Latin.”



*Steven Johnson is the author of "Everything Bad Is Good For You." His new book, "The Ghost Map," about an epidemic in Victorian London, will be published later this month.*

**Correction: Oct. 22, 2006**

*An article on Oct. 8 about Will Wright, a video-game inventor, referred incorrectly to a filmmaking team who, like him, explored the "long zoom," in which viewers' perspectives are examined from very far away to very close. Charles and Ray Eames were husband and wife, not brothers.*

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Long-zoom compacts fill the gap between pocketable cameras and interchangeable lens models with expensive lenses, offering a great combination of lens reach and portability. Read on to learn about our favorite enthusiast long zoom cameras. The widest range long zoom pocket camera from Nikon is the CoolPix S9100, which features a 12.1MP imaging sensor and an 18x 25-450mm equivalent zoom lens. Other features found on the CoolPix S9100 include high-speed, 9.5-frame-per-second image capture; a 3.0-inch 921,000-dot LCD; 1080p full HD video with stereo sound; ISO sensitivity up to ISO 3200 and low-light shooting modes including Night Landscape, Night Portrait and Backlighting HDR. This type of camera boasts long zoom lenses and DSLR style handling, without the faff (and expense) of having to buy and pack multiple optics. Thanks to offering many of the same manual control modes, they're a versatile and budget-friendly alternative to DSLRs. If you're new to photography, don't worry there's always a range of straightforward auto modes too.