I once invested a dollar when Mantle raffled off a ham. I won, only there was no ham. That was one of the hazards of entering a game of chance, Mickey explained.

— Jim Bouton, *Ball Four*, 1970
FROM ITS EARLIEST DAYS, THE MODERN COMIC HAS GRAPPLING WITH THE PROBLEM OF SHOWING MOTION IN A STATIC MEDIUM.

HOW DO YOU SHOW THIS ASPECT OF TIME IN AN ART WHERE TIME STANDS STILL?

THOUGH SEQUENTIAL ART SURVIVED FOR MANY CENTURIES WITHOUT DEPICTING MOTION, ONCE THE GENIE WAS OUT OF THE BOTTLE IT WAS PERHAES INEVITABLE THAT MORE AND MORE EFFICIENT MEANS WOULD BE SOUGHT. AT FIRST, THIS SEARCH CENTERED ON MULTIPLE IMAGES IN SEQUENCE.

BUT JUST AS A SINGLE PANEL CAN REPRESENT A SPAN OF TIME THROUGH COMIC.

SMILE!

PAF!

SO TOO CAN A SINGLE PANEL REPRESENT A SPAN OF TIME THROUGH PICTURES.

SOMEBEWHERE BETWEEN THE FUTURISTS' DYNAMIC MOVEMENT AND DUCHAMP'S DIAGRAMMATIC CONCEPT OF MOVEMENT LIES COMIC'S 'MOTION LINE.'
In the beginning, motion lines—or "zip-ribbons" as some call them—were used to represent the paths of moving objects through space.

Over the years, these lines became more refined and stylized, even diagrammatic.

Eventually, in the hands of heroic fantasy artists like Bill Everett and Jack Kirby, those same lines became so stylized as to almost have a life and physical presence all their own.
BECAUSE OF THEIR ABILITY TO DEPICT ACTION WITH DRAMA, SUCH CONSPICUOUS ACTION LINES HAVE BEEN AN AMERICAN SPECIALTY FOR YEARS.

IN THIS APPROACH, BOTH THE MOVING OBJECT AND THE BACKGROUND ARE DRAWN IN A CLEAR, ARTICULATED STYLE AND THE PATH OF MOTION IS IMPOSED OVER THE SCENE.

OTHER ARTISTS TRIED ADDITIONAL EFFECTS SUCH AS MULTIPLE IMAGES OF THE SUBJECT, ATTEMPTING TO INVOLVE THE READER MORE DEEPLY IN THE ACTION.

STILL OTHERS, SUCH AS MARVEL'S GENE COXAN, BEGAN INCORPORATING PHOTOGRAPHIC STREAKING EFFECTS WITH SOME INTRIGUING RESULTS IN THE SIXTIES AND SEVENTIES.

MULTIPLE IMAGES CAN BE FOUND IN THE WORK OF KIRBY, INFANTINO AND OTHERS.
Colan, who was also a film buff, was of course aware that when a camera’s shutter speed is too slow to fully freeze a moving object’s image, an interesting blurring effect occurs.

A car going at 60 MPH might look like this.

But if the camera moves with the moving object, that object will remain focused while the background will now be streaked.

American comics artists took little or no interest in this kind of photographic trickery.

And in Europe where motion lines were used only sparingly, it was likewise ignored.

But in Japan once again, a very different comics culture embraced this very different concept of motion as their own!
"SUBJECTIVE MOTION" as I call it, operates on the assumption that if observing a moving object can be involving, being that object should be more so.

Japanese artists, starting in the late 60s, began putting their reader's "in the driver's seat" with panels like these.

And starting in the mid-eighties, a few American artists began to adopt the effect in their own work. Until by the early nineties it has become fairly common.

Are these the only ways we can portray motion in a single panel? Think about it.
IN A MEDIUM WHERE TIME AND SPACE MERGE—
THE STORYTELLER HAS SOME UNUSUAL TOOLS AT HIS/HER DISPOSAL—
—SUCH AS THE POLYPYCH WHERE A MOVING FIGURE OR FIGURES—
—IS IMPOSED OVER A CONTINUOUS BACKGROUND.

IN COMICS, COMPOSITION FOLLOWS A VERY DIFFERENT SET OF RULES THAN IN MOST GRAPHIC ART.

BY INTRODUCING TIME INTO THE EQUATION, COMICS ARTISTS ARE ARRANGING THE PAGE IN WAYS NOT ALWAYS CONDUCTIVE TO TRADITIONAL PICTURE-MAKING.

HERE, THE COMPOSITION OF THE PICTURE IS JOINED BY THE COMPOSITION OF CHANCE. THE COMPOSITION OF DRAMA—

AND THE COMPOSITION OF MEMORY.

IF THE COMPOSITION OF A SINGLE PANEL IS TRULY "PERFECT" DOESN'T THAT MEAN THAT IT CAN— OR EVEN SHOULD—STAND ALONE?

THE NATURAL WORLD CREATES GREAT BEAUTY EVERY DAY, YET THE ONLY RULES OF COMPOSITION IT FOLLOWS ARE THOSE OF FUNCTION AND CHANCE.

COMICS, AT ITS BEST, SHOULD DO NO LESS.
As we’ve seen, the interaction of time and comics generally leads us to one of two subjects: sound or motion.

Sound breaks down into two subsets: word balloons and sound effects.

Motion also breaks down into two subsets: the first type—panel-to-panel closure—was important enough to merit its own chapter.

The other type—motion within panels—can be further divided into several distinct styles. I’ve covered the ones I know, but there may be many others. Time will tell.

The workings of time in comics should be as simple as—

One...—Two...—Three... — but they’re not.
I've been trying to figure out what makes comics "tick" for years and I'm still amazed by the strangeness of it all.

Snap! Snap!

CRASH!

But no matter how bizarre the workings of time in comics is--

The face it presents to the reader--

Is one of simple normality.

Or the illusion of it, anyway.

All depends on your frame of mind.
On Being the Right Size
J. B. S. Haldane, 1928

The most obvious differences between different animals are differences of size, but for some reason the zoologists have paid singularly little attention to them. In a large textbook of zoology before me I find no indication that the eagle is larger than the sparrow, or the hippopotamus bigger than the hare, though some grudging admissions are made in the case of the mouse and the whale. But yet it is easy to show that a hare could not be as large as a hippopotamus, or a whale as small as a herring. For every type of animal there is a most convenient size, and a large change in size inevitably carries with it a change of form.

Let us take the most obvious of possible cases, and consider a giant man sixty feet high—about the height of Giant Pope and Giant Pagan in the illustrated Pilgrim’s Progress of my childhood. These monsters were not only ten times as high as Christian, but ten times as wide and ten times as thick, so that their total weight was a thousand times his, or about eighty to ninety tons. Unfortunately the cross sections of their bones were only a hundred times those of Christian, so that every square inch of giant bone had to support ten times the weight borne by a square inch of human bone. As the human thigh-bone breaks under about ten times the human weight, Pope and Pagan would have broken their thighs every time they took a step. This was doubtless why they were sitting down in the picture I remember. But it lessens one’s respect for Christian and Jack the Giant Killer.

To turn to zoology, suppose that a gazelle, a graceful little creature with long thin legs, is to become large, it will break its bones unless it does one of two things. It may make its legs short and thick, like the rhinoceros, so that every pound of weight has still about the same area of bone to support it. Or it can compress its body and stretch out its legs obliquely to gain stability, like the giraffe. I mention these two beasts because they happen to belong to the same order as the gazelle, and both are quite successful mechanically, being remarkably fast runners.

Gravity, a mere nuisance to Christian, was a terror to Pope, Pagan, and Despair. To the mouse and any smaller animal it presents practically no dangers. You can drop a mouse down a thousand-yard mine shaft; and, on arriving at the bottom, it gets a slight shock and walks away, provided that the ground is fairly soft. A rat is killed, a man is broken, a horse splashes. For the resistance presented to movement by the air is proportional to the surface of the moving object. Divide an animal’s length, breadth, and height each by ten; its weight is reduced to a thousandth, but its surface only to a hundredth. So the resistance to falling in the case of the small animal is relatively ten times greater than the driving force.

An insect, therefore, is not afraid of gravity; it can fall without danger, and can cling to the ceiling with remarkably little trouble. It can go in for elegant and fantastic forms of support like that of the daddy-longlegs. But there is a force which is as formidable to an insect as gravitation to a mammal. This is surface tension. A man coming out of a bath carries with him a film of water of about one-fiftieth of an inch in thickness. This weighs roughly a pound. A wet mouse has to carry about its own weight of water. A wet fly has to lift many times its own weight and, as everyone knows, a fly once wetted by water or any other liquid is in a very serious position indeed. An insect going for a drink is in as great danger as a man leaning out over a precipice in search of food. If it once falls into the grip of the surface tension of the water—that is to say, gets wet—it is likely to remain so until it drowns. A few insects, such as water-beetles, contrive to be unwettable; the majority keep well away from their drink by means of a long proboscis.
Of course tall land animals have other difficulties. They have to pump their blood to greater heights than a man, and, therefore, require a larger blood pressure and tougher blood-vessels. A great many men die from burst arteries, greater for an elephant or a giraffe. But animals of all kinds find difficulties in size for the following reason. A typical small animal, say a microscopic worm or rotifer, has a smooth skin through which all the oxygen it requires can soak in, a straight gut with sufficient surface to absorb its food, and a single kidney. Increase its dimensions tenfold in every direction, and its weight is increased a thousand times, so that if it is to use its muscles as efficiently as its miniature counterpart, it will need a thousand times as much food and oxygen per day and will excrete a thousand times as much of waste products.

Now if its shape is unaltered its surface will be increased only a hundredfold, and ten times as much oxygen must enter per minute through each square millimetre of skin, ten times as much food through each square millimetre of intestine. When a limit is reached to their absorptive powers their surface has to be increased by some special device. For example, a part of the skin may be drawn out into tufts to make gills or pushed in to make lungs, thus increasing the oxygen-absorbing surface in proportion to the animal’s bulk. A man, for example, has a hundred square yards of lung. Similarly, the gut, instead of being smooth and straight, becomes coiled and develops a velvety surface, and other organs increase in complication. The higher animals are not larger than the lower because they are more complicated. They are more complicated because they are larger. Just the same is true of plants. The simplest plants, such as the green algae growing in stagnant water or on the bark of trees, are mere round cells. The higher plants increase their surface by putting out leaves and roots. Comparative anatomy is largely the story of the struggle to increase surface in proportion to volume.

Some of the methods of increasing the surface are useful up to a point, but not capable of a very wide adaptation. For example, while vertebrates carry the oxygen from the gills or lungs all over the body in the blood, insects take air directly to every part of their body by tiny blind tubes called tracheae which open to the surface at many different points. Now, although by their breathing movements they can renew the air in the outer part of the tracheal system, the oxygen has to penetrate the finer branches by means of diffusion. Gases can diffuse easily through very small distances, not many times larger than the average length traveled by a gas molecule between collisions with other molecules. But when such vast journeys—from the point of view of a molecule—as a quarter of an inch have to be made, the process becomes slow. So the portions of an insect’s body more than a quarter of an inch from the air would always be short of oxygen. In consequence hardly any insects are much more than half an inch thick. Land crabs are built on the same general plan as insects, but are much clumsier. Yet like ourselves they carry oxygen around in their blood, and are therefore able to grow far larger than any insects. If the insects had hit on a plan for driving air through their tissues instead of letting it soak in, they might well have become as large as lobsters, though other considerations would have prevented them from becoming as large as man.

Exactly the same difficulties attach to flying. It is an elementary principle of aeronautics that the minimum speed needed to keep an aeroplane of a given shape in the air varies as the square root of its length. If its linear dimensions are increased four times, it must fly twice as fast. Now the power needed for the minimum speed increases more rapidly than the weight of the machine. So the larger aeroplane, which weighs sixty-four times as much as the smaller, needs one hundred and twenty-eight times its horsepower to keep up. Applying the same principle to the birds, we find that the limit to their size is soon reached. An angel whose muscles developed no more power weight for weight than those of an eagle or a pigeon would require a breast projecting for about four feet to house the muscles engaged in working its wings, while to economize in weight, its legs would have to be reduced to mere stilts. Actually a large bird such as an eagle or kite does not keep in the air mainly
by moving its wings. It is generally to be seen soaring, that is to say balanced on a rising column of air. And even soaring becomes more and more difficult with increasing size. Were this not the case eagles might be as large as tigers and as formidable to man as hostile aeroplanes.

But it is time that we pass to some of the advantages of size. One of the most obvious is that it enables one to keep warm. All warm-blooded animals at rest lose the same amount of heat from a unit area of skin, for which purpose they need a food-supply proportional to their surface and not to their weight. Five thousand mice weigh as much as a man. Their combined surface and food or oxygen consumption are about seventeen times a man’s. In fact a mouse eats about one quarter its own weight of food every day, which is mainly used in keeping it warm. For the same reason small animals cannot live in cold countries. In the arctic regions there are no reptiles or amphibians, and no small mammals. The smallest mammal in Spitzbergen is the fox. The small birds fly away in winter, while the insects die, though their eggs can survive six months or more of frost. The most successful mammals are bears, seals, and walruses.

Similarly, the eye is a rather inefficient organ until it reaches a large size. The back of the human eye on which an image of the outside world is thrown, and which corresponds to the film of a camera, is composed of a mosaic of “rods and cones” whose diameter is little more than a length of an average light wave. Each eye has about a half a million, and for two objects to be distinguishable their images must fall on separate rods or cones. It is obvious that with fewer but larger rods and cones we should see less distinctly. If they were twice as broad two points would have to be twice as far apart before we could distinguish them at a given distance. But if their size were diminished and their number increased we should see no better. For it is impossible to form a definite image smaller than a wavelength of light. Hence a mouse’s eye is not a small-scale model of a human eye. Its rods and cones are not much smaller than ours, and therefore there are far fewer of them. A mouse could not distinguish one human face from another six feet away. In order that they should be of any use at all the eyes of small animals have to be much larger in proportion to their bodies than our own. Large animals on the other hand only require relatively small eyes, and those of the whale and elephant are little larger than our own. For rather more recondite reasons the same general principle holds true of the brain. If we compare the brain-weights of a set of very similar animals such as the cat, cheetah, leopard, and tiger, we find that as we quadruple the body-weight the brain-weight is only doubled. The larger animal with proportionately larger bones can economize on brain, eyes, and certain other organs.

Such are a very few of the considerations which show that for every type of animal there is an optimum size. Yet although Galileo demonstrated the contrary more than three hundred years ago, people still believe that if a flea were as large as a man it could jump a thousand feet into the air. As a matter of fact the height to which an animal can jump is more nearly independent of its size than proportional to it. A flea can jump about two feet, a man about five. To jump a given height, if we neglect the resistance of air, requires an expenditure of energy proportional to the jumper’s weight. But if the jumping muscles form a constant fraction of the animal’s body, the energy developed per ounce of muscle is independent of the size, provided it can be developed quickly enough in the small animal. As a matter of fact an insect’s muscles, although they can contract more quickly than our own, appear to be less efficient; as otherwise a flea or grasshopper could rise six feet into the air.

And just as there is a best size for every animal, so the same is true for every human institution. In the Greek type of democracy all the citizens could listen to a series of orators and vote directly on questions of legislation. Hence their philosophers held that a small city was the largest possible democratic state. The English invention of representative government made a democratic nation
possible, and the possibility was first realized in the United States, and later elsewhere. With the development of broadcasting it has once more become possible for every citizen to listen to the political views of representative orators, and the future may perhaps see the return of the national state to the Greek form of democracy. Even the referendum has been made possible only by the institution of daily newspapers.

To the biologist the problem of socialism appears largely as a problem of size. The extreme socialists desire to run every nation as a single business concern. I do not suppose that Henry Ford would find much difficulty in running Andorra or Luxembourg on a socialistic basis. He has already more men on his pay-roll than their population. It is conceivable that a syndicate of Fords, if we could find them, would make Belgium Ltd or Denmark Inc. pay their way. But while nationalization of certain industries is an obvious possibility in the largest of states, I find it no easier to picture a completely socialized British Empire or United States than an elephant turning somersaults or a hippopotamus jumping a hedge.
The Fascination of the Miniature

Steven Millhauser

The realm of the miniature awaits its passionate and scholarly explorer. It is a realm richly furnished with creations that strike deep into the imagination, creations such as intricately carved chessmen, paper circuses and theaters, peach-pit monkeys, pastries in the shape of cathedrals, the little clockwork coach described by Poe at the beginning of "Maelzel's Chess-Player," boxwood rosary beads the size of plums that open to reveal minutely carved scenes from the life of Christ, the enchanting Praxinoscope Theater invented by Emile Reynaud in 1879, the tiny tin and copper kitchen utensils made by the copper founders of medieval Nuremberg to supply the needs of dolls. A thick and sumptuously illustrated volume longs to be written about the history of miniature objects, their types and classes, their uses, their cultural significance, their status as works of art, and a second volume, no less thick, might well consider their imaginative offspring in works of literature, including within its compass such matters as the kingdom of Lilliput, the history of marionettes in fiction, the haunted dollhouse in the story by M. R. James, the adventures of Pigwiggin in Drayton's "Nymphidia," the homunculus in Faust, the miniature populations in The Mysterious Stranger, and the use of the inanimate and animate miniature, from dollhouses and toy theaters to living dolls and Thumbelina, in nineteenth-century children's books. What I wish to do here, however, is only to consider the nature of the miniature itself, and to ask what it is that enchants the imagination in the presence of this second world.

Wherein lies the fascination of the miniature? Smallness alone compels no necessary wonder. A grain of sand, an ant, a raindrop, a bottle cap, may interest or amaze the eye, but they do not arrest the attention with that peculiar intensity elicited by the miniature. They do not cast a spell. The miniature, then, must not be confused with the merely
minute. For the miniature does not exist in isolation: it is by nature a smaller version of something else. The miniature, that is to say, implies a relation, a discrepancy. An object as large as a dollhouse can exert the fascination of the miniature as fully as the minutest teacup in the doll’s smallest cupboard.

But why should discrepancy possess an interest? I believe the answer is this, that discrepancy of size is a form of distortion, and all forms of distortion shock us into attention: the inattentive and jaded eye, passing through a world without interest, helplessly perceives that something in the bland panorama is not as it should be. The eye is irritated into attention. It is compelled to perform an act of recognition. Perhaps for the first time since childhood, it sees. But what I have said is true of all forms of discrepancy, and not only the particular discrepancy that is the miniature. Some understanding of the spell cast by this particular discrepancy may be gained by first considering the nature of the particular discrepancy that is the gigantic.

The gigantic seizes my attention with a force equal to that of the miniature, but it does not affect me in the same way. It awes, it does not charm. The gigantic produces in the beholder a sensation of discomfort, of danger. A flea magnified is the stuff of nightmare. It compels a horrified attention. The bees of Brobdingnag are more terrible than the cannon of Lilliput. Take an object as innocent as a salt-shaker, imagine it eighty feet high—and though you may smile, your smile will be uneasy, you will not escape the sense of dread inherent in hugeness. The gigantic beanstalk is as terrifying as the giant. Perhaps the gigantic reminds one of the distorted world of early childhood, a world of immense rooms with soaring walls, hung with high pictures and supplied with windows beginning too high from the floor, rooms filled with enormous dangerous objects reaching higher than one’s head, like the terrifying glass table in _Alice_ with the little key at the top.

The gigantic continually threatens to elude us, to grow too large for possession by the eye. There is something lush, profuse, unstoppable in the very idea of the gigantic.
We gaze up at the Brobdingnagians, and their heads vanish in the clouds; the gigantic grasshopper in the Museum of Science in Boston decomposes into a multiplicity of parts; and even the inch-high magnification of a flea threatens to escape visual possession by being profusely precise.

But let us inquire more closely into the relation between the gigantic object and the object from which it springs. Magnification, or gigantification, appears to effect two important changes: it creates detail unseen before, and it changes the shape of original detail. The object has ceased to be itself, by becoming more of itself. Gulliver, exposed to a Brobdingnagian breast, sees imperfections and discolorations that make him reflect upon the fair skins of English ladies; and when he later sees the naked Brobdingnagian maids of honor, he remarks that their moles are the size of trenchers, and the hairs on the moles thicker than packthreads. Or, to take a different and more familiar example: in any book of insects one can see the eyes of an ant. In more specialized books one can see the hairs on the legs of the ant and the claws at the end of the legs. We see detail unseen before, and the shape and structure of the legs changes with each increase in size. These pictures are so commonplace that the sense of shock may be lost, and one must turn to the popular literature of horror—the monstrous insects depicted in macabre comic books, for instance—to feel for a moment the original force of dread.

Unlike the gigantic, the miniature is without dread. Here lies part of its secret charm. We allow ourselves to surrender completely, untranslated by danger. We hold aloof from the gigantic, fascinated but appalled; we yield to the miniature in sensual self-surrender. But not only is the miniature without dread, it also invites possession. And herein lies a deeper secret. For the world is elusive, we do not possess it. Large objects especially elude us. We cannot possess a house the way we can possess a chair, we cannot possess a chair the way we can possess a cup, we cannot see things with true completeness. We can know a house room by room, on the inside, but we cannot take in with the eye all the rooms on a floor. A dollhouse allows
us to possess a house in this way, to see it more completely. The fascination of the miniature is in part the fascination of the mountain view. To be above, to look down, to take into the yearning eye more at a single glance: here we are at the very threshold of the lure of the miniature.

As a child I longed to have an extra pair of eyes at the back of my head. What was that longing but an impatience with human limitation, a reluctance not to see everything, a refusal, in short, not to be God?

I have said that the gigantic increases detail, and it may seem evident that the miniature by its very nature must decrease or suppress detail. But this is by no means the case. The miniature, more closely considered, has a special and rather complex relation to detail. The very fact of smallness demands in us an increased attention; the face is brought close to the object, and in many instances the size of the face and even of the eyes has become gigantic in relation to the object. The eye, blazing down in an act of fierce attention, experiences a hunger for detail. This is a point of utmost importance, for the eye seized by the miniature will quickly tire if it does not perceive thoroughness of execution, richness of detail. As a child I was bitterly disappointed by the little green trees of my miniature barnyard. It was not that they were made of plastic, although I was troubled by the difference between the look of leaves and the look of plastic; rather it was that they were so lacking in detail. They were flat, not bushy, with a mere suggestion of leafage; the trunks were not even brown, but green. What I longed for was not a closer approximation, but a precise tree in miniature, with individual leaves in which minute veins were visible, a tree with twigs and branches, and in those branches a miniature nest woven of miniature twigs and miniature bits of string. My little trees were boring, they deceived me and I did not forgive them, as one never forgives a work of art that is general and vague. I could only play with them by not looking at them closely, by imagining their perfection. Far more satisfying was the balsa wood ship model I watched my father build. There was a little cabin with a window, a miniature brass capstan and a miniature wheel,
miniature lifeboats with miniature seats suspended from miniature davits, and an intricate system of rigging that used black thread. Even my cardboard barnyard with separate stalls and a ladder reaching to the hayloft could not compete in precision.

Thus the miniature *seizes* the attention by the fact of discrepancy, and *holds* it by the quality of precision. The miniature strives toward the ideal of total imitation. The more precise, the more wonder-compelling. For this reason the miniature must never be so small as to blur detail. An inch-long ship can compel wonder and charm but will weary the eye sooner than an elaborate and precise two-foot model, unless by some miracle of construction the inch-long ship should reproduce faithfully all the detail captured by the model. The relation between smallness and the amount of precise detail is the measure of our wonder.

A problem might seem to arise: if the gigantic version of a minute object is smaller than the miniature version of a large object, will not the small gigantic object exercise over us the particular fascination associated with the miniature? Will not the two-inch ant charm us more than the two-foot ship? The problem is resolved by recollecting that the gigantic and the miniature are both discrepancies, and depend for their effect solely on the relation to their originals.

Something of the wonderful precision attained by practitioners of the art of the miniature is suggested by a particularly charming specimen described all too briefly by D'Israeli in his *Curiosities of Literature*. “In the year 1675, the Duke de Maine received a gilt cabinet, about the size of a moderate table. On the door was inscribed, ‘The Apartment of Wit.’ The inside exhibited an alcove and a long gallery. In an armchair was seated the figure of the duke himself composed of wax, the resemblance the most perfect imaginable. On one side stood the Duke de La Rochefoucauld, to whom he presented a paper of verses for his examination. M. de Marcillac, and Bossuet bishop of Meaux, were standing near the armchair. In the alcove Madame de Thianges and Madame de la Fayette sat re-
tired, reading a book. Boileau, the satirist, stood at the
door of the gallery, hindering seven or eight bad poets
from entering. Near Boileau stood Racine, who seemed
to beckon to La Fontaine to come forwards.” One wishes
he had described these miniature waxworks in more de-
tail. Were they provided with fingernails, for instance, and
could one see the half-moons on the fingernails? What was
the book that Madame de Thianges and Madame de la
Fayette were so busily reading? Might one read the verses
presented by the duke to La Rochefoucauld? But the ex-
ample suffices to suggest a degree of precision that would
have delighted my childhood, had it been applied to any
of my toys.

There is a special development of the art of the mini-
ture that requires separate comment, for it has a unique
relation to the gigantic. I refer to the Oriental art of pro-
ducing a miniature so minute that the detail is not per-
ceptible to the naked eye. Here by a splendid paradox the
experience of the miniature is rendered possible only by
means of a magnifying lens: gigantification itself ushers
us into the enchanted realm of the miniature. But an im-
portant distinction must be drawn between the magnifi-
cation of a tiny object that is not a miniature and the mag-
nification of a tiny miniature. In both cases, detail unseen
before is suddenly revealed. But the microscopic mini-
ture can have in it, as part of its proper and intended ef-
fect, no more detail than was put into it by the artist. In
this sense it is exhaustible. It wishes to reveal itself com-
pletely. But the magnification of an object that is not a
miniature need not cease at any point. Indeed the very
nature of normal magnification always implies the possi-
bility of new detail about to be revealed. Thus, as in all
instances of genuine gigantification, we are continually
threatened by the unseen. For if we now see more than
we saw before, must there not be still more hidden from
view? In the special instance of the magnified miniature,
however, we experience the soothing sense that we are
seeing everything that is actually there. The gigantic
threatens unceasing revelation, the miniature holds out
the promise of total revelation.
A curious and highly unusual case of the miniature is that of the moon. Consider the full moon only, and ignore for the sake of clarity the complication of phases. We experience the moon as a round flat object about the size of a quarter, shining in the sky. We do not experience it directly as anything other than what it appears to be. But we are educated to think of the moon as a gigantic globe-like object, covered with mountains and craters; and as evidence of this remarkable assertion we are even offered photographs of the surface. Therefore when we look up at the moon, our direct experience is contradicted by our education, so that instead of experiencing the moon as a small white disk we experience it as a miniature version of itself, though lacking in detail. When we observe the moon through a telescope, our experience is even stranger. The moon is magnified, new detail is seen—but the gigantification remains a miniaturization of what we believe to be the actual moon. In fact, the process of magnification makes the moon approach the ideal of the miniature, since it remains a miniature in relation to the actual moon but has grown rich in detail. At this point it differs from a true miniature only by virtue of the fact that it is a natural rather than an artificial object.

But let us return to the question of precision, which I have said is part of the fascination of the miniature. Now if this is so, I may ask: why should I crave precision, why should I refuse suggestion? And here I feel we are about to cross the threshold into the darkness of the mystery of the miniature. That craving for absolute precision, is it not a craving for the duplication of the world itself, its replication in miniature? Do not my ship model, my barnyard, my little tree, imply a little universe? The gigantic reveals the terror of Nature, lays bare our secret dread. The gigantic ant is a monster; but suddenly I know that the original ant is no less monstrous. A drop of water is terrible. A grain of sand is terrible. There is no difference between a grain of sand and a galaxy. We inhabit a universe so utterly alien that to look steadily at that blaze of darkness would burn out the eyes of the mind. The gigantic reveals to us the monstrous terror in the heart of things.
The universe is too large for us. Death is too large for us. Death hums in every stone. The great walls soar, the windows are too high. But suddenly the walls descend, the windows are little spaces we kneel to peer through. The solar system contracts to an orrery. I am under the spell of the miniature. Galaxies and supernovas turn at the end of my kaleidoscope. I gratify my secret desire: I become a giant. I draw out leviathan with a hook, I play with him as with a bird. I stretch out the north over the empty place, and hang the earth upon nothing. I have compassed the water with bounds, until the day and night come to an end.

The miniature, then, is an attempt to reproduce the universe in graspable form. It represents a desire to possess the world more completely, to banish the unknown and the unseen. We are teased out of the world of terror and death, and under the enchantment of the miniature we are invited to become God.

And yet, after all, there remains a stirring of doubt. For the truth is, I am still not satisfied. Is it perhaps not enough to be God? I think of Alice and the little door. I want to be small, I want to pass through the door into the enchanted garden. And here is the farthest I can see into the mystery of the miniature: its separation from myself, its banishment of me. Hence the sadness, the secret poignance, of dollhouses, model whaling ships, glass animals, little automatons. No, it is not enough to be God, I wish to be my own creature. And is it possible that the deepest fascination of the miniature lies here, in the unfulfilled yearning to be part of that world? For we are in disharmony with the world, we do not fit in anywhere. We are banished forever from the garden on the other side of the door. Under the sway of the miniature I contemplate my isolation, and my contemplation is clean, uncorrupted by the impurity of terror.
Don’t follow these rules!
A Primer for Playtesting
Nathalie Pozzi and Eric Zimmerman

During our 2012 residency at the University of the Arts Berlin, we spent the summer with Graduate Fellows playtesting projects from theater, architecture, sound installation, games, philosophy, and more. This essay outlines the playtesting methodology we used by suggesting possible “rules” for structuring your own playtests.

What is playtesting?
Playtesting is a methodology borrowed from game design where unfinished projects are tested on an audience. A playtest happens when people come together to try out a work in progress. The next steps for changing the project are based on the results of the playtest.

Playtesting is also an attitude towards the creative process, an approach that emphasizes problem-solving through iteration and collaboration with members of your audience.

When is playtesting useful?
Playtesting can help develop any kind of work that involves interaction between a created experience and a participatory audience. Although many of the ideas of playtesting come from game design, they can be applied in any field.

What does playtesting look like?
Playtesting can look like any number of things. At the University of the Arts, we met as a group on a regular basis and shared works in progress. We would spend about 30-60 minutes interacting with and discussing one project – perhaps in a studio space, perhaps outdoors in a park or on the street - and then move on to the next.

Isn’t playtesting the same as user testing/editing/rehearsal/critique?
Yes and no. Playtesting is not discipline-specific and versions of it can be found in many practices. The style of playtesting we outline here comes from game design and is particularly relevant for projects that involve direct audience interaction.
THE “RULES”

.....before you playtest

A. Playtest before you think you are ready
You always playtest a work in progress, not a finished design. That means you should playtest as early as you possibly can – usually much earlier than you think you should. It is much much better to playtest your ugly prototype than to wait and playtest a more polished project. A playtest is not a presentation. If you feel ready and comfortable to present and playtest your design, you have waited too long – it is probably too late to make substantial changes. Train yourself to overcome your discomfort and playtest as early in the process as you possibly can.
Is it too early for you to playtest? If the answer is yes, then playtest anyway.

B. Strategize for early playtesting
Figure out how to create a working prototype far in advance of any final deadline. This is often a question of tactical implementation. Can you make a paper prototype of a digital project? Can you scale down a work meant for 100 participants to something you can playtest with a dozen? Rather than plan your entire project in advance, focus instead on what is needed to enable the next playtest.
Simplify your project so that you can playtest today.

C. Know why you are playtesting
Enter into every playtest with a concrete idea about what you want to learn and what questions you hope the playtest will answer. Narrowing what you want the playtest to investigate can help you simplify your project and playtest sooner. Generating research questions in advance will also help you structure the playtest itself. If you are doing things right, your playtest will raise issues and questions that you did not anticipate. However, you should still go into every playtest with a clear agenda.
What is the one key question that you want your playtest to answer?

D. Prepare variations
Go into a playtest with different versions of your project to try out. This allows you to make the most out of the playtest session and it also helps you to improvise and try out new ideas during the playtest. Variations might mean different sets of game rules to play, software settings to cycle through, or contexts for a performance. Variations give you options if something breaks down, and they let you do comparisons to see which variation works best. One tip: change as little as possible each time (only one element) so that you can understand better the exact effects of your change.
What can you change to try out different variations of your project?

E. Be grateful to your playtesters
Whoever is playtesting your project is doing you a big favor. They are donating their time and attention for the sole purpose of helping you with your unfinished project. Playtesting is hard. But no matter how much stress and uncertainty you might have about the project, try and maintain a feeling of gratitude towards your playtesters. Be happy they are there and be sure to let them know how thankful you are for their time.

*Take a deep breath and say thanks.*

F. Design the learning experience
Remember to design the way that people will learn about your project. If you are creating a complicated interactive system, the experience of learning how to understand and interact with the system is an important part of the overall design problem.

*Does your playtest address the learning process?*

G. Blame yourself, not your playtesters
Remember to warn your playtesters that they will be interacting with an unfinished, rough version of what will at some later point be a smoother experience. Be sure to tell them that if they are frustrated or confused, it is not their fault – it is your fault for not designing a better experience for them. It’s OK for them to be confused – after all, the most valuable part of the playtest is not what they do understand, but what they don’t.

*Never make your playtesters feel foolish.*

H. Know your testers
What do you need to know about your playtesters before the playtest begins? If you are meeting them for the first time or don’t know them very well, talk with each person and take notes that will help put their reaction to your project in context. Playtesters come in many varieties. For example, the learning curve of a hardcore gamer is very different than someone without deep experience in a particular game genre.

*Do you know who your playtesters are?*

I. Don’t explain
Put the project ahead of the theory. Resist the temptation to explain the ideas and intentions behind your project to your playtesters. Instead, let them interact with the LEAST possible explanation from you in advance. By explaining your ideas beforehand, you are ruining the chance to see the authentic reactions that your project provokes. It is hard to hold back and not explain. But by forcing your project to carry your ideas (rather than your explanation), you are challenging your work to be better.
Is it possible to not say anything before the playtest starts?

J. Take notes
In game design, we often prepare a sheet of paper for each playtester, with questions written out and room to take notes. The notes page is structured to facilitate what you need to know BEFORE, DURING, and AFTER each playtest. During a discussion, taking notes will help to elicit better feedback – if your testers see you taking notes they will be more likely to give you detailed and thoughtful answers.
Prepare a notes sheet and use it. It is worth the extra effort.

....during a playtest

K. Be selfish
The purpose of your playtest is not for your playtesters to have fun. It is for you to learn what does and does not work about your project. If you try too hard to give playtesters a good time, you will lose the opportunity to get the hard truth from them. Don’t be afraid to show your playtesters something broken and half-finished. That is in fact the entire premise of the playtest.
Don’t worry about being entertaining.

L. Encourage your playtesters to talk aloud
If it is possible for your project, ask your playtesters to talk out loud about their thoughts and feelings as they interact with your work. A “think-aloud” playtester can give you valuable insight into how they are perceiving and interpreting the details of your project. Let your playtesters tell you why they are doing what they are doing and what they think is happening as a result. This may require that you periodically remind them to vocalize.
Don’t be shy about reminding your playtesters to think aloud.

M. Notice everything
Prepare on your notes sheet the categories of the main things you want to observe, such as when players seemed frustrated, what make them laugh, or how many times they tried and failed before they gave up. Keep track of how long it took to run the playtest, which variations your testers preferred, and any other important information. Try to take notes on everything that you can – otherwise, you will be at the mercy of your selective memory, which will cast everything in the best possible light.
Are you noticing everything – or just what you want to see?
N. Shut up
While you are observing the playtest, say as little as possible. You will feel an
overwhelming urge to help out your playtesters, to tell them what to do and what
they are doing wrong. But you must do everything you can to not interfere. Their
mistakes and misunderstandings are extremely useful: you must let them explore
the project on their own. If they are completely confused, step in and assist them,
but in general you should do everything you can to shut up. If you tell them what
to do, you lose the main purpose of the playtest, which is to see how OTHER
people react to your project. Learning to shut up during a playtest requires
discipline.
Can you shut up – not a just little, but really, completely, shut up?

O. See the big picture
As your playtesters interact with your project, remember to not just focus on the
workings of your designed system. Try to see the human element at play. What
are the emotional responses of your playtesters, what is their body language,
how are they interacting with each other? Seeing the bigger picture can help you
understand when your audience is engaged and when they are bored. It is easy
to focus too much on what you designed, rather than on the effect it is having.
Stay focused on the impact of the project, not just the project itself.

P. Don’t be afraid of data
One way to get objective about your playtest is to record data and put it in a
spreadsheet. Every project has data to collect: At what moments did everyone
fall silent? How many steps did each participant take as they walked through the
space? If you are working in software, the program can record important user
input, such as time spent in different areas of the experience. Otherwise, just
remember to record the data in your notes. Too much data can be overwhelming
to interpret, but tracking the right data can be incredibly valuable.
What is the data that will answer your key questions?

Q. Answer a question with a question
When playtesters ask you how something works, or what something means, it is
probably because they are confused. Rather than explain it to them, you can
answer their inquiry with a question of your own. Don’t tell them what the blue
button does – instead, ask them what they think it does, or even better, what they
think it SHOULD do. It’s more important to get them to speculate about your
project than for you to explain it to them. Their opinions are more valuable than
yours.
Every time a playtester asks you something, ask them something back.

R. Hunger for failure
One of the attitudes that helps with playtesting is to yearn for your project to fail.
Of course we all want successful results, but unsuccessful moments are much
more useful. If you are only looking for the successes, you will remember the smiles and laughter and think that your project is in perfect shape (we call this the “happy face syndrome”). But you need to cultivate a desperate hunger to focus on what is not working properly. Otherwise, your project will never get better. Are you enjoying the successful moments too much and ignoring the failures?

....after a playtest

S. Discuss what happened
After the playtest, talk about the experience with your playtesters. Use your notes sheet to structure the conversation. Begin with very specific questions, such as what was most difficult for them to understand about the project, or why they reacted to a particular aspect of the design. Finish with more general questions, such as what they liked best about the experience or what they would change to make it better. The more concrete your questions, the more useful answers you will get.

T. Put feedback into context
It can be useful to distinguish between expert and non-expert testers. Experts are familiar with what it means to make a project like yours. Non-experts aren’t. When getting critical feedback from non-experts, remember that they are the patient and you are the doctor – you can take their suggestions as symptoms of what is and isn’t working in the project, rather than as directions for the next steps in your design. If someone tells you to tear down a room and make it bigger, they are really telling you that it feels small. Rather than take their advice, perhaps just rearrange the furniture. Don’t expect your players to understand all of the ramifications of every suggestion they make. Ask for feedback, but don’t take suggestions literally.

U. Collaborate with your playtesters
One of the most thrilling moments of playtesting is collaborating with your playtesters – brainstorming with them, trying out their ideas, and seeing how the changes impact your project. Plan your playtest session so that you have time to experiment with new ideas as they emerge through the playtesting itself. They are seeing the project with fresh eyes and so their ideas are often better than yours. Embrace shared authorship with your playtesters.

V. The cruelly honest playtest
Playtests represent moments of truth – when your brilliant ideas may all come crashing down. Playtests are truthful because they are a safe place to simulate your final context. When your project is completed, you probably won’t be there to explain away all of the problems and defend your intentions. In a playtest, you
get to cruelly see whether or not your ideas actually work in practice. Part of the
daytest attitude is building up your pain tolerance and coming to enjoy the hard
truth of the playtest.
*Face the truth of your playtest, even if it hurts.*

**W. Embrace the unexpected**

Never forget that *play* is half of *playtest*. Being playful means being open to
unexpected, happy accidents. Let go of the way you *want* your work to be used
or interpreted. Be open to the strange new things people do with your project.
Accidents are for those who are ready to take advantage of them.
*If things don’t go as planned, you may be on to something better.*

**X. The playtest’s the thing**
The playtesting process is as important as the actual project you are making. If
you can manage to get the process right, then you will find that the problems in
your project begin to solve themselves.
*Forget what you are making. Focus on how you make it.*

**Y and Z. Break these rules**

There is no single magic solution that will solve every problem you encounter. So
you need to create the process that works for you. Don’t follow these “rules.”
They are not meant to be followed – they are meant to be twisted, modified,
broken, and refashioned into something new. The best playtest is the one you
invent yourself.

- Nathalie & Eric
The Design Evolution of Magic: The Gathering

Richard Garfield

Context

I wrote the original Magic design notes shortly after Magic was published. I felt an urgency to document the development of Magic like I have seldom felt before—there were so many people and ideas and events woven around these years that I knew would quickly slip from memory. I was aware that over the following years my thoughts on what made a good trading card game, and the design principles of games had evolved, so when interest was shown in my original design notes it seemed like a good opportunity to try and add that decade of perspective to the original document. The updated version of this essay was first published in Game Design Workshop, by Tracy Fullerton, Christopher Swain, and Steven Hoffman (published 2004, CMP Books). It is reprinted here with permission.

The Game Design Process

Game Economies

Richard was teaching at Whitman College for his second year after completing his Ph.D. in Mathematics at the University of Pennsylvania, when his first game, Magic: The Gathering was published. The game was the first trading card game, which has since become an industry of its own. Since then he has published many other trading card games, as well as board and card games.
Thoughts from Richard Garfield, 10 Years Ago and Today

_Magic: The Gathering is one of the most important and influential games of our time. It was an instant hit when it first appeared at the Gen Con game convention in 1993 and has grown steadily in popularity since. This is a special two-part look at the creation and development of the game as written by the designer, Richard Garfield. Richard wrote the first part “The Creation of Magic: The Gathering” nearly 10 years ago when the game was first released. In it he muses about the design challenges of a collectable trading card game and he recounts the game’s fascinating playtest history. The second part “Magic Design: A Decade Later” is a retrospective on the original design notes. In it Richard provides insight about how and why the game has evolved the way it has—including thoughts on today’s Magic Pro Tour, Magic Online, and the next ten years for the game._

The Creation of Magic: The Gathering—Notes from the Designer (written 1993)

The Ancestry of Magic

Games evolve. New ones take the most loved features of earlier games and add original characteristics. The creation of Magic: The Gathering is a case in point.

Though there are about a dozen games that have directly influenced Magic in one way or another, the game’s most influential ancestor is a game for which I have no end of respect: Cosmic Encounter, originally published by Eon Products and re-released by Mayfair Games. In this game, participants play alien races striving to conquer a piece of the universe. Players can attempt their conquest alone, or forge alliances with other aliens. There are nearly fifty alien races which can be played, each of which has a unique ability: the Amoeba, for example, has the power to Ooze, giving it unlimited token movement; the Sniveler has the power to Whine, allowing it to automatically catch up when behind. The best thing about Cosmic Encounter is precisely this limitless variety. I have played hundreds of times and still can be surprised at the interactions different combinations of aliens produce. Cosmic Encounter remains enjoyable because it is constantly new.

Cosmic Encounter proved to be an interesting complement to my own design ideas. I had been mulling over a longtime idea of mine: a game that used a deck of cards whose
composition changed between rounds. During the course of the game, the players would add cards to and remove cards from the deck, so that when you played a new game it would have an entirely different card mix. I remembered playing marbles in elementary school, where each player had his own collection from which he would trade and compete. I was also curious about Strat-o-matic™ Baseball, in which participants draft, field, and compete their own teams of baseball players, whose abilities are based on real players’ previous year statistics. Intrigued by the structure of the game, I was irritated that the subject was one for which I had no patience.

These thoughts were the essence of what eventually became Magic. My experiences with Cosmic Encounter and other games inspired me to create a card game in 1982 called Five Magics. Five Magics was an attempt to distill the modularity of Cosmic Encounter down to just a card game. The nature of Cosmic Encounter seemed entirely appropriate for a magical card game—wild and not entirely predictable, but not completely unknown, like a set of forces you almost, but don’t quite, understand. Over the next few years, Five Magics went on to inspire entirely new magical card games among my friends.

Ten years later, I was still designing games, and Mike Davis and I had come up with a board game called RoboRally. Mike was acting as our agent, and among the companies he approached was a brand-new gaming company called Wizards of the Coast. Things seemed to be going well, so that August, Mike and I made our way to Portland, Oregon to meet over a pizza with Peter Adkison and James Hays of Wizards of the Coast.

Both Peter and James were very receptive to RoboRally, but informed me that they weren’t really in a position to come out with a board game right away. This wasn’t what I had come out to hear, of course, but I didn’t want the trip to be a total waste. I asked Peter what he would be interested in. Peter replied that he really saw a need for a game that could be played quickly with minimal equipment, a game that would go over well at conventions. Could I do it?

Within a few days, the initial concept for a trading card game was born, based on another card game I had developed in 1985 called Safecracker. It hadn’t been one of my best games. But then I remembered Five Magics.

**The First Designs**

I went back to graduate school at the University of Pennsylvania, and worked on the card game in whatever spare time I had. It wasn’t easy; there were three months of false starts on
the project, there are so many aspects of card game design that have to be reconsidered when designing trading card games. First of all, you can’t have any bad cards—people wouldn’t play with them. In fact, you want to prevent too much range in the utility of cards because players will only play with the best—why make cards people won’t play with? Besides, homogeneity of card power is the only way to combat the “rich kid syndrome” that threatened the game concept from the start. What was to keep someone from going out and getting ten decks and becoming unbeatable?

It was a major design concern. I had numerous theories on how to prevent purchasing power from unbalancing the game, none of which were entirely valid but all of which had a grain of truth. The most compelling counter to this “buy-out-the-store” strategy was the ante. If we were playing for ante, the argument ran, and your deck was the distilled fruit of ten decks, when I did win, I would win a more valuable card. Also, if the game had enough skill, then the player purchasing their power would surely be easy prey for the players dueling and trading their way to a good deck. And of course there was the sentiment that buying a lot of poker chips doesn’t make you a winner. In the end, however, the “rich kid syndrome” became less of a concern. Magic is a fun game, and it doesn’t really matter how you get your deck. Playtesting showed that a deck that is too powerful defeats itself. On the one hand, people stopped playing against it for ante unless a handicap was invoked; on the other, it inspired them to assemble more effective decks in response.

The first Magic release was affectionately named Alpha. It consisted of 120 cards split randomly between two players. The two players would ante a card, fight a duel over the ante, and repeat until they got bored. They often took a long time to get bored; even then, Magic was a surprisingly addictive game. About ten o’clock one evening, Barry “Bit” Reich and I started a game in the University of Pennsylvania Astronomy lounge, a windowless, air-conditioned room. We played continuously until about 3:00am—at least that’s what we thought, until we left the building and found that the sun had risen.

I knew then that I had a game structure that could support the concept of individually owned and tailored decks. The game was quick, and while it had bluffing and strategy, it didn’t seem to get bogged down with too much calculation. The various combinations that came up were enjoyable and often surprising. At the same time, the variety of card combinations didn’t unbalance the game: when a person started to win, it didn’t turn into a landslide.
From Alpha to Gamma

Except for the card mix, little has changed about Magic since Alpha. In Alpha, walls could attack, and losing all your lands of a particular color destroyed the associated spells in play, but otherwise, the rules are much the same now as they were in the early stages of playtesting.

Moving from Alpha to the Beta version was like releasing a wild animal. The enjoyable game that was Alpha now burst the confines of the duel to invade the lives of the participants. Players were free to trade cards between games and hunt down weaker players to challenge them to duels, while gamely facing or cravenly avoiding those who were more powerful. Reputations were forged—reputations built on anything from consistently strong play to a few lucky wins to good bluffing. The players didn’t know the card mix, so they learned to stay on their toes during duels. Even the most alert players would occasionally meet with nasty surprises. This constant discovery of unknown realms in an uncharted world gave the game a feeling of infinite size and possibility.

For the Gamma version, new cards were added and many of the creature costs were increased. We also doubled the pool of playtesters, adding in a group with Strat-o-matic Baseball experience. We were particularly anxious to find out if Magic could be adapted for league play. Gamma was also the first version, which was fully illustrated. Skaff Elias was my art director: he and others spent days poring over old graphic magazines, comic books, and game books searching for art for the cards. These playtest decks were pretty attractive for crummy black-and-white cardstock photocopies. For the most part, the cards were illustrated with serious pictures, but there were a lot of humorous ones as well. Heal was illustrated by Skaff’s foot. Power Sink showed Calvin (of “Calvin and Hobbes”) in a toilet; after all, what is a toilet but a power sink? Berserk was John Travolta dancing in Saturday Night Fever. Righteousness pictured Captain Kirk, and Blessing showed Spock doing his “live long and prosper” gesture. An old comic book provided a Charles Atlas picture for Holy Strength, and a 98-pound weakling getting sand kicked in his face for Weakness. Instill Energy was Richard Simmons. The infamous Glasses of Urza were some X-ray glasses we found in a catalog. Ruthy Kantorovitz constructed a darling flame-belching baby for Firebreathing. I myself had the honor of being the Goblins. The pictures and additional players greatly added to the game atmosphere. It became clear that while the duels were for two players, the more players playing, the better the game was. In some sense, the individual duels were a part of a single, larger game.
Striking the Balance

Each playtest set saw the expulsion of certain cards. One type of card that was common in Alpha and Beta was rare in Gamma, and is now nonexistent: the type that made one of your rival’s cards yours. Yes, Control Magic used to permanently steal a creature from your opponent. Similarly, Steal Artifact really took an artifact. Copper Tablet no longer even remotely resembles its original purpose, which was to swap two creatures in play. (“Yes, I’ll swap my Merfolk for your Dragon. On second thought, make that my Goblins—they’re uglier.”) There was a spell, Planeshift, which stole a land, and Ecoshift, which collected all the lands, shuffled them and re-dealt them—really nice for the user of four or five colors of magic. Pixies used to be a real pain—if they hit you, you swapped a random card from your hand with your opponent. These cards added something to the game, often in the form of players trying to destroy their own creatures before their opponents took them for good, or even trying to take their own lives to preserve the last shreds of their decks. However, in the end it was pretty clear that the nastiness this added to the game environment wasn’t worth the trouble, and no card should ever be at risk unless players choose to play for ante.

It was around this time that I began to realize that some players would oppose almost any decision made about the game, often vehemently. The huge amount of dissent about what should and should not be part of the card mix has led players to make their own versions for playtesting—a significant task that involves designing, constructing, shuffling, and distributing about 4000 cards. Each of these games had its merits, and the playtesters enjoyed discovering the quirks and secrets of each new environment. The results of these efforts will form the basis of future Deckmaster games that use the structure of The Gathering, while containing mostly new cards.

To Build a Better Deck

Playtesting a Deckmaster game is difficult. Probably the only games harder to playtest are elaborate, multi-player computer games. After developing a basic framework for Magic that seemed fairly robust, we had to decide which of the huge selection of cards to include, and with what relative frequencies. Common cards had to be simple, but not necessarily less powerful, than rare cards—if only rare cards were powerful, players would either have to be rich or lucky to get a decent deck. Sometimes a card was made rare because it was too powerful or imbalancing in large quantities, but more often, rare cards were cards that were intricate or specialized—spells you wouldn’t want many of anyway. But these design guidelines only
got us so far. The whole game’s flavor could change if a handful of seemingly innocent cards were eliminated, or even made less or more common. When it came down to actually deciding what to include and what to do without, I began to feel like a chef obliged to cook a dish for 10,000 people using 300 ingredients.

One thing I knew I wanted to see in the game was a player using multicolor decks. It was clear that a player could avoid a lot of problems by stripping down to a single color. For this reason, many spells were included that paralyzed entire colors, like Karma, Elemental Blast, and the Circles of Protection. The original plan was to include cards that thwarted every obvious simple strategy, and, in time, to add new cards which would defeat the most current ploys and keep the strategic environment dynamic. For example, it was obvious that relying on too many big creatures made a player particularly vulnerable to the Meekstone, and a deck laden with Fireballs and requiring lots of mana could be brought down with Manabarbs. Unfortunately, this strategy and counter-strategy design led to players developing narrow decks and refusing to play people who used cards that could defeat them flat out. If players weren’t compelled to play a variety of players and could choose their opponent every time, a narrow deck was pretty powerful.

Therefore, another, less heavy-handed way to encourage variety was developed. We made it more difficult to get all the features a player needs in a deck by playing a single color. Gamma, for example, suffered from the fact that blue magic could stand alone. It was easily the most powerful magic, having two extremely insidious common spells (Ancestral Memory and Time Walk), both of which have been made rare. It had awesome counterspell capabilities. It had amazing creatures, two of the best of which are now uncommon.

Blue magic now retains its counterspell capability, but is very creature poor, and lacks a good way to do direct damage. Red magic has little defense, particularly in the air, but has amazing direct damage and destruction capability. Green magic has an abundance of creatures and mana, but not much more. Black is the master of anti-creature magic and has some flexibility, but is poorly suited to stopping non-creature threats. White magic is the magic of protection, and the only magic with common banding, but has little damage-dealing capability.

Sometimes seemingly innocuous cards would combine into something truly frightening. A good part of playtest effort was devoted to routing out the cards that contributed to so-called “degenerate” decks—the narrow, powerful decks that are difficult to beat and often
boring to play with or against. Without a doubt, the most striking was Tom Fontaine’s “Deck of Sooner-Than-Instant Death,” which was renowned for being able to field upwards of eight large creatures on the second or third turn. In the first Magic tournament, Dave “Hurricane” Pettex walked to victory with his “Land Destruction Deck.” (Dave also designed a deck of Spectres, Mindtwists, and Disrupting Sceptres that was so gruesome I don’t think anyone was ever really willing to play it.) Skaff’s deck, “The Great White Death,” could outlive just about anything put up against it. Charlie Catin’s “Weenie Madness” was fairly effective at swamping the opponent with little creatures. Though this deck was probably not in the high-win bracket of the previous decks, it was recognized that, playing for ante, Charlie could hardly lose. Even winning only one in four of his games—and he could usually do better than that—the card he won could be traded back for the island and the two Merfolk he lost, with something extra thrown in.

In the end I decided that the degenerate decks were actually part of the fun. People would assemble them, play with them until they got bored or their regular opponents refused to play against them, and then retire the deck or trade off its components for something new—a Magic version of putting the champion out to stud. Most players ended up treating their degenerate decks much like roleplayers treat their most successful characters: they were relegated to the background, to be occasionally dusted off for a new encounter.

After the pursuit of sheer power died down, another type of deck developed: the Weird Theme deck. These decks were usually made to be as formidable as possible within the constraints of their theme. When Bit grew bored of his “Serpent Deck” (he had a predilection for flopping a rubber snake on the playing surface and going “SssssSssSs” whenever he summoned a Serpent), he developed his “Artifact Deck,” which consisted of artifacts only—no land. It was fun to see the “Artifact Deck” go up against someone who used Nevinyrral’s Disk. But the king of weird decks was, without a doubt, Charlie Catin. In one league, he put together a deck that I call “The Infinite Recursion Deck.” The idea was to set up a situation where his opponent couldn’t attack him until Charlie could play Swords to Plowshares on a creature. Then he would play Timetwister, causing the cards in play to be shuffled with the graveyard, hand, and library to form a fresh library. Swords to Plowshares actually removes a creature from the game, so his rival has one less creature. Repeat. After enough iterations, his rival was bloated with life given by the Swords to Plowshares, having maybe 60 life points, but there were no creatures left in his deck. So Charlie’s Elves started in—59 life, 58 life, 57
life—and the curtain closes on this sad game. I still can’t think about this deck without moist emotional snorts. The coup de grace is that this league required players to compete their decks ten times. And, since his games often lasted over an hour and a half, he received at least one concession.

Words, Words, Words

It was not just determining the right card mix that players and designers found challenging. This becomes increasingly clear to me as I participate in the never-ending process of editing the rules and the cards. As my earliest playtesters have pointed out (in their more malicious moods), the original concept for Magic was the simplest game in the world because you had all the rules on the cards. That notion is long gone.

To those who didn’t have to endure it, our struggle for precision was actually rather amusing. My own rules discussions about card wordings were mostly with Jim Lin, who is the closest thing you will ever encounter to a combination rules lawyer and firehose. A typical rule-problem session would go:

James: “Hmm—there seems to be a problem with this card. Here is my seven-page rules addition to solve the problem.”

Richard: “I would sooner recall all the cards than use that. Let’s try this solution instead.”

Jim: “Hmm—we have another problem.”

[Repeat until...]

Richard: “This is silly—only incredibly stupid and terminally anal people could possibly misinterpret this card.”

Jim: “Yes, maybe we have been thinking about this too long. If you’re playing with that kind of person, you should find some new friends.”

A specific example of something we actually worried about is whether Consecrate Land would really protect your land from Stone Rain. After all, the first says it prevents land from being destroyed and the second says it destroys the land. Isn’t that a contradiction? It still hurts my head getting into a frame of mind where that is confusing. It is perhaps a little like wondering why anyone would give you anything for money, which is, after all, just paper.

But, then again, I could never tell what was going to confuse people. One of the playtesters, Mikhail Chkhenkeli, approached me and said, “I like my deck. I have the most
powerful card in the game. When I play it, I win on the next turn.” I tried to figure out what this could be; I couldn’t think of anything that would win the game with any assurance the turn after casting. I asked him about it and he showed me a card that would make his opponent skip a turn. I was confused until I read exactly what was written: “Opponent loses next turn.” It was my first real lesson in how difficult it was going to be to word the cards so that no two people would interpret the same card in a different way.

The Magic Marketplace

Another thing I realized in the second year of playtesting really surprised me. Magic turned out to be one of the best economic simulations I had ever seen. We had a free-market economy and all of the ingredients for interesting dynamics. People valued different cards in different ways—sometimes because they simply weren’t evaluating accurately, but much more often because the cards really have different value to different players. For example, the value of a powerful green spell was lower for a person who specializes in black and red magic than for one who was building a deck that was primarily green. This gives a lot of opportunity for arbitrage. I would frequently find cards that one group of players wasn’t using but another group were treating like chunks of gold. If I was fast enough, I could altruistically benefit both parties and only have to suffer a little profit in the process.

Sometimes the value of a card would fluctuate based on a new use (or even a suspected new use). For example, when Charlie was collecting all the available spells that produced black mana, we began to get concerned—those cards were demanding higher and higher prices, and people began to fear what he could need all that black mana for. And, prior to Dave’s “Land Destruction Deck,” land destruction spells like Stone Rain and Ice Storm were not high-demand spells. This of course allowed him to assemble the deck cheaply, and after winning the first Magic tournament, sell off the pieces for a mint.

Trade embargoes appeared. At one point a powerful faction of players would not trade with Skaff, or anyone who traded with Skaff. I actually heard conversations such as:

Player 1 to Player 2: “I’ll trade you card A for card B.”

Skaff, watching: “That’s a moronic trade. I’ll give you card B and cards C, D, E and F for card A.”

Players 1 and 2 together: “We are not trading with you, Skaff.”
Needless to say, Skaff was perhaps a bit too successful in his early duels and trades.

Another interesting economic event would occur when people would snatch up cards they had no intention of using. They would take them to remove them from the card pool, either because the card annoyed them (Chaos Orb, for example) or because it was too deadly against their particular decks.

I think my favorite profit was turned during an encounter with Ethan Lewis and Bit. Ethan had just received a pack of cards and Bit was interested in trading with Ethan. Bit noticed that Ethan had the Jayemdae Tome, began to drool, and made an offer for it. I looked at the offer and thought it was far too low, so I put the same thing on the table.

Bit looked at me and said, “You can’t offer that! If you want the Tome you have to bid higher than my bid.”

I said, “This isn’t an offer for the Tome. This is a gift for Ethan deigning to even discuss trading the Tome with me.”

Bit looked at me in disbelief, and then took me aside. He whispered, “Look, I’ll give you this wad of cards if you just leave the room for ten minutes.” I took his bribe, and he bought the Tome. It was just as well—he had a lot more buying power than I did. In retrospect, it was probably a dangerous ploy to use against Bit—after all, he was the person who was responsible for gluing poor Charlie’s deck together once, washing a different deck of Charlie’s in soap and water, and putting more cards of Charlie’s in the blender and hitting frappé.

Probably the most constant card-evaluation difference I had with anyone was over Lord of the Pit. I received it in just about every playtest release we had, and it was certainly hard to use. I didn’t agree with Skaff, though, that the only value of the card was that you might get your opponent to play with it. He maintained that blank cards would be better to play with because blank cards probably wouldn’t hurt you. I argued that if you knew what you were doing, you could profit from it.

Skaff asked me to cite a single case where it had saved me. I thought a bit and recalled the most flamboyant victory I had with it. My opponent knew he had me where he wanted me—he had something doing damage to me, and a Clone in hand, so even if I cast something to turn the tide, he would be able to match me. Well, of course, the next cast spell was a Lord of the Pit; he could Clone it or die from it, so he Cloned it. Then each time he attacked, I would heal both of the Lords, or cast Fog and nullify the assault, and refuse to attack. Eventually, he ran out of creatures to keep his Lord of the Pit sated and died a horrible death.
Skaff was highly amused by this story. He said, “So, when asked about a time the Lord of the Pit saved you, you can only think of a case where you were playing somebody stupid enough to clone it!”

**Dominia and the Role of Roleplaying**

Selecting a card mix that accommodated different evaluations of the cards wasn’t enough; we also had to develop an environment in which the cards could reasonably interact. Establishing the right setting for Magic proved to be a central design challenge. In fact, many of our design problems stemmed from an attempt to define the physics of a magical world in which duels take place and from building the cards around that, rather than letting the game define the physics. I was worried about the cards’ relationship to each other—I wanted them to seem part of a unified setting, but I didn’t want to restrict the creativity of the designers or to create all the cards myself. Everyone trying to jointly build a single fantasy world seemed difficult, because it would inevitably lack cohesion. I preferred the idea of a multiverse, a system of worlds that was incredibly large and permitted strange interactions between the universes in it. In this way, we could capture the otherworldly aspects of fantasy that add such flavor to the game while preserving a coherent, playable game structure. Almost any card or concept would fit into a multiverse. Also, it would not be difficult to accommodate an ever-growing and diverse card pool—expansion sets with very different flavors could be used in the same game, for they could be seen as a creative mingling of elements from different universes. So I developed the idea of Dominia, an infinite system of planes through which wizards travel in search of resources to fuel their magic.

In its structured flexibility, this game environment is much like a roleplaying world. I don’t mean to suggest that this setting makes Magic a roleplaying game—far from it—but Magic is closer to roleplaying than any other card or board game I know of. I have always been singularly unimpressed by games that presumed to call themselves a cross between the two because roleplaying has too many characteristics that can’t be captured in a different format. In fact, in its restricted forms—as a tournament game or league game, for example—Magic has little in common with roleplaying. In those cases, it is a game in the traditional sense, with each player striving to achieve victory according to some finite set of rules. However, the more free-form game—dueling with friends using decks constructed at whim—embodies some interesting elements of roleplaying.
Each player’s deck is like a character. It has its own personality and quirks. These decks often even get their own names: “The Bruise,” “The Reanimator,” “Weenie Madness,” “Sooner-Than-Instant Death,” “Walk Into This Deck,” “The Great White Leftovers,” “Backyard Barbeque,” and “Gilligan’s Island,” to name a few. In one deck I maintained, each of the creatures had a name—one small advantage to crummy photocopied cardstock is the ease of writing on cards. The deck was called “Snow White and the Seven Dwarves,” containing a Wurm named Snow White and seven Mammoths: Doc, Grumpy, Sneezy, Dopey, Happy, Bashful, and Sleepy. After a while I got a few additional Mammoths, which I named Cheesy and Hungry. There was even a Prince Charming: my Veteran Bodyguard.

As in roleplaying, largely the players determine the object of the game in the unstructured mode of play. The object of the duel is usually to win, but the means to that end can vary tremendously. Most players find that the duel itself quickly becomes a fairly minor part of the game compared to trading and assembling decks.

Another characteristic of Magic, which is reminiscent of roleplaying, is the way players are exploring a world rather than knowing all the details to start. I view Magic as a vast game played among all the people who buy decks, rather than just a series of little duels. It is a game for tens of thousands in which the designer acts as a gamemaster. The gamemaster decides what the environment will be, and the players explore that environment. This is why there are no marketed lists of cards when the cards are first sold: discovering the cards and what they do is an integral part of the game.

And like a roleplaying game, the players contribute as much to an exciting adventure as the gamemaster. To all the supporters of Magic, and especially to my playtesters, I am extraordinarily grateful. Without them, if this product existed at all, it would certainly be inferior. Every one of them left a mark, if not on the game itself, then in the game’s lore. Any players today that have even a tenth of the fun I had playing the test versions with them will be amply pleased with Magic.

**Magic Design: A Decade Later (written 2003)**

Magic and the trading card game industry have undergone a lot of changes since the time I wrote those design notes. In the meantime Magic has grown stronger with each successive year—as the game itself is improved, and more people are brought into trading card games from products such as Pokemon and Yu-Gi-Oh. 
It is difficult for people these days to appreciate how little we knew about the game design space we were entering in the early nineties. My design notes failed to mention what in my mind is the strongest sign of that—after describing the concept of a trading card game to Peter Adkison I concluded with the cautious statement “of course, such a game may not be possible to design.” It is hard for me to imagine that state of mind today, in a world where trading card games have reached every corner and are a part of almost every major entertainment property. This is a world where trading card games have left their mark on all areas of game design, from computer games to board games; and where trading card games have directly inspired games ranging from trading miniature games to trading tops games. This is a world where Jason Fox, from the comic strip Foxrot, complained that a deck of cards coming with only 4 aces was some sort of ploy to get people to buy expansion kits.

That could be left as the end of the story; Magic was designed—as the design notes of a decade ago portray—and 10 years later it was still going strong. But this leaves out a large part of the story, since Magic was anything but a static game since then. The changes and improvements to Magic warrant design notes of their own.

**First and Foremost: a Game**

One thing that may look arcane in my notes to people, who know something about the game market, is my reference to the form of game that Magic launched as a “trading card game”, rather than a “collectable card game”. I still use TCG rather than CCG, which became the industry standard despite my efforts from its earliest days. I prefer “trading” rather than “collectable” because I feel it emphasizes the playing aspect rather than the speculation aspect of the game. The mindset of making collectables runs against that of making games—if you succeed in the collectable department then there is a tendency to keep new players out and to drive old ones away because of escalating prices. One of the major battles that Magic fought was to make it perceived principally as a game and secondarily as a collectable. Good games last forever—collectables come and go.

This was not merely theoretical speculation—Magic’s immense success as a collectable was severely threatening the entire game. Booster packs intended to be sold at a few bucks were marked up to 20 dollars in some places as soon as they hit the shelves. While many people view this time as the golden age of Magic the designers knew that it was the death of the game in the long run. Who is going to get into the game when it was immediately inflated in price so much? How many people would play the game if doing so was wearing
holes in some of their most valuable assets? We might be able to keep a speculation bubble going for a while, but the only way Magic was going to be a long term success—a classic game—was for it to stand on its game play merits, not on its worthiness as an investment.

During "Fallen Empires", the fifth Magic expansion, we finally produced enough cards that the speculative market collapsed. The long-term value of Magic could perhaps thrive—but it wouldn’t immediately price itself out of the reach of new players before they got a chance to try it. There was an inevitable negative patina that Magic got for a while, and "Fallen Empires" still has, but from this point on Magic was sinking or swimming on its game merits. Fortunately, Magic turned out to be a strong swimmer.

**Binding the Unbounded**

The part of my notes, which I believe, reveals my biggest change in thinking over the last decade is the statement that in the future we would publish other games with mechanics similar to Magic. What I was referring to is what became “Ice Age” and “Mirage”, two expansions for Magic. Why did I think these would be entirely new games, rather than what they ended up being—expansions for the main game?

We all realized from the start that we couldn’t just keep adding cards to Magic and expect it to stay popular. One reason for that is that each successive set of cards was a smaller and smaller percentage of the entire pool of cards, and so would necessarily have less and less impact on the whole of the game. This was illustrated vividly by players of “Ice Age” talking about how the entire set introduced two relevant cards to the game. One can imagine how the designers felt—working for years to make “Ice Age” a compelling game to have it boil down to a mere two cards. Another, perhaps more important reason, is that new players wouldn’t want to enter a game where they were thousands of cards behind, so our audience would inevitably erode.

Initially we saw two solutions to this problem:

*Make cards ever more powerful.* This is a route many trading card game makers followed—and one I greatly dislike. It feels like strong-arming the players to buy more and more rather than really providing them more game value. But it would bring new players in, because they wouldn’t need the obsolete old cards.

*Eventually conclude Magic: The Gathering, and start a new game—Magic: Ice Age, for example.* I advocated this approach, because I believed we could make exciting new game environments indefinitely. When one set was finished, players wouldn’t be forced to buy into the
new game to keep competitive, they could move on if they wanted a change—and new players could begin on equal footing.

When it actually came time to do "Ice Age" it was absolutely clear that players would not stand for a new version of Magic, we had to think of something else. Additionally, we were also worried that fragmenting the player audience was a bad idea; if we made a lot of different games, people would have a harder and harder time finding players.

The solution we found was to promote different formats of game play—many of which involved only more recent sets of cards. Today there are popular formats of play which involve only the most recently published cards, cards published in the last 2 years, and cards published in the last 5 years, in addition to many others. While this does fragment the player base—since you may not be able to find players who play your format—it is less draconian than different games since you can apply your cards to many different formats over time. This was a far more flexible approach than the first—as it didn’t command players to start fresh—it allowed them to, and allowed new players to join the game without being overwhelmed.

**Trading Card Games Are not Board Games**

I used to believe that trading card games were far more like board games than they are. This is not surprising, since I had no trading card games before Magic to draw examples from, and so was forced to use the existing world of games to guide my thinking on TCGs. A lot of my design attitudes grew from this misconception. For example, my second trading card game was designed to be best with 4 or more people, and took several hours to play. These are not bad parameters for a board game, but trading card games really want to be much shorter—because so much of the game is about replaying with a modified, or entirely new deck.

In a similar vein I used what I saw board game standards to be when it came to rules clarifications. It was common in board games to find a different group played a slightly different way, or had house rules to suit their tastes. With board games different interpretations of the rules and ways of play were not a major problem because players tended to play with fairly isolated groups. This led me to be quite anti-authoritarian when it came to the "correct" way to play. It turned out that a universal standard for a trading card game was far more necessary than a board game, because the nature of the game form made the interconnectivity of the game audience was far greater.

This meant that we had to take more and more responsibility for defining the rules and standards of play. In some ways this is analogous to being forced to construct the tourna-
ment rules for a game. The rules to Bridge are not that complex but when you write out the official tournament rules—really try to cross the t’s and dot the i’s—you have a compendium.

I had also hoped that players could moderate their own deck restrictions. We knew that certain card combinations were fun to discover and surprise someone with, but not fun to play with on an ongoing basis. So we figured players would make house rules to cover those decks and the responsible cards. The highly interconnected nature of Magic made it unreasonable to expect that, however, since every playgroup came up with a vast number of restrictions and rules, and they all played with each other. This meant we had to take more responsibility in designing the cards and when necessary, banning cards that were making the game worse.

**The Pro Tour**

All this precision invested in the design of the rules and cards made Magic a surprisingly good game to play seriously. We began to entertain ideas of really supporting a tournament structure with big money behind it—big enough players could, if good enough—make a living off of playing Magic. This was a controversial subject at Wizards of the Coast for a while—the worry being that making the game too serious would make it less fun. I subscribed fully to the concept of a Pro Tour—thinking of how the NBA helped make basketball popular and didn’t keep the game from being played casually as well.

The Pro Tour had an almost immediate effect. Our players rapidly became much better as the top level ones devoted time to really analyzing the game and as that game tech filtered down through the ranks. Before the Pro Tour I am confident that I was one of the best players in the world, now I am mediocre at best.

Now there are thousands of tournaments each week, and many players have earned a lot of money playing Magic, some in the hundreds of thousands of dollars. At the last World Championship there were 56 countries competing. There is a never-ending buzz of Magic analysis and play as players attempt to master the ever-changing strategic ground of Magic. I believe this is a major part of Magic’s ongoing popularity. If even a small group of people takes a good game very seriously, there can be far reaching effects.

**Magic Online**

Online Magic didn’t come into its own until last year. For a long time I have wanted to see an online version of Magic that duplicated real life Magic as closely as possible. That is, the
online game would connect people, run the games and the tournaments, and adjudicate rules—but little else. At first we tried to form partnerships with computer game companies to do this—but our partners always had other ideas about how to do computer Magic. Eventually we hired a programming studio to do it our way and now we have Magic Online.

One of the striking things about Magic Online is that we use the same revenue model as in real life. Despite exhortations to use a subscription model, we chose to sell virtual cards, which you could trade with other players online. This allows players to buy some cards and then play them indefinitely with no further fee—as in real life.

It was important to us that we not make it a better deal playing online than off—we wanted it to be the same. That is because we feel the paper game contributes a lot to Magic’s ongoing popularity, and it could be threatened if many of its players go to the online game.

For this reason one of the prime targets for the online game was going to be lapsed players. Many studies had been done on how long people play Magic and why they leave the game, and for the most part they didn’t leave because they were bored with the game, they left because they had life changes which made it more difficult to play—for example getting jobs or having kids. These players would potentially rejoin the game if they could play from their own home on their own hours.

Magic Online is still a bit too young to be sure about—but it appears to have acquired a dedicated sizeable audience of players without hurting the paper game. Many of the players are formerly lapsed players as we had hoped.

**The Next 10 Years**

Who knows what the next decade will bring? Ten years ago I had no clue at all, it was an exciting time and we were riding a roller coaster. Now I am more confident—I believe that Magic is fairly stable, and that there is every reason to believe that it will be around and as strong in another 10 years. At this point it is clear that Magic is not a fad, and as many new players are coming in each year as are leaving the game.

Certainly Magic has stayed fresh for me. I get into the game every few months; joining a league, constructing a deck, or perhaps preparing for and participating in a tournament. Every time I return I find the game fresh and exciting, with enough different from the previous time to keep me on my toes, but enough the same that I can still exploit my modest skills at the game. I look forward to my next 10 years of the game.
Interaction and Choice

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

Games are all about choices. Their interesting, ambiguous decisions and the consequences that result are a fundamental part of what makes games games. So what does it mean for a game to have false choices?

Video gamers are all too familiar with the false choice, which is blended in seamlessly with the larger non-choice experience. Half Life 2's level design was, in fact, lauded for how convincingly it went about the matter of presenting false choices. People said, “even though it's totally linear, it never really feels linear.” When a building collapses over a door, leaving only another corridor as an available route, you feel as if there was a choice to be made, but you just barely missed it.

Any choice in the category of “do X or die” is also a false choice. Of course, almost all games have some of these choices. In chess, for example, moving your king out of checkmate is a false choice (sometimes you have a choice about where to move him, but not always). In a checkmate situation, the rules literally forbid you from doing anything but moving your king. In every game there will be similar situations.

Saving/Loading

Many false choices are easily avoidable, and we should take care to do so. In my opinion the typical savegame system, which lets you save the game at specific points (or worse, at any time) and reload it at any time, turns everything in games into false choices. If you don’t like the outcome of a given choice, you can (and really should) simply undo it by loading the game. For this reason, saving/loading is a form of legalized cheating, and something that needs to be addressed very soon in mainstream digital games.

All of the reasons for the defense of saving/loading come from game features that are problematic to begin with. “We need saving/loading, because the game has to be 80 hours long!” “We need saving/loading, because the game is story-driven and therefore the player has to win!” “We need saving/loading, because we couldn’t possibly balance this amount of content!” This is the nature of the defense of this mechanism.

Keep in mind, I’m not against a system that lets a player suspend the game—I’m not saying players should have to play games in one sitting. Smart games, such as Mount & Blade and most roguelikes, have save-and-exit systems, allowing players to stop playing whenever they want and then continue from where they left off. Loading is only possible from the title screen. I’m advocating that all games have this system.

Grinding

Grinding (as defined by ex-Dungeon Crawl: Stone Soup lead designer David Ploog) is any activity that a player can do repeatedly with minimal
or no risk and that results in an in-game reward. The most obvious and well-known examples of grinding are those found in RPGs (particularly Japanese RPGs), in which you can (and often have to) fight low-level monsters (who are no threat to you) over and over and over again to gain experience points. But there are other examples in other genres, too: one such example might be fetch quests, which have you run an item from one place to another in-game. Almost all of the gameplay in Farmville is pure grinding. The game tells you, “click on this thing for 300 points.” There’s no reason to not click on it, so it’s just a chore the game makes you do.

Grinding is bad for two reasons. First, it presents a false choice because you should grind your Pokémon up to level 99. There’s no in-game reason for you not to do that: it only benefits you. This leads to the second reason, which is that you’re motivating players to bore themselves. In fact, you’re using the player’s boredom to counterbalance the tedium of grinding. The thinking goes, “Well, players will become totally unbalanced after grinding for two hours, but they’ll get bored before that.”

Perhaps this begs the question, why do so many games have grinding if it’s obviously such a bad thing? The answer is that grinding works. The human mind is an archaic and exploitable thing, and our evolutionary imperatives are easily taken advantage of. Evolutionary needs, such as the need to gather and the need to show status, are being exploited when we’re playing Pokémon, World of Warcraft, or slot machines. No one finds grinding interesting; it is a compulsive behavior.

Game designs should never encourage people to do uninteresting no-brainers once, let alone repeatedly, because games are about decisions and building skills. Games can, and should, be making every effort to enrich the lives of their players, and not simply suck their time away from them.

Too Many Choices

The opposite of the false-choice problem (which is not having enough choices) is to present the player with too many choices. Having too many choices can be just as bad as having too few, and like so many other things in life, this element of game design is a balancing act.

A very obvious example of a game with too many choices is when your hand consists of 20 or more cards in Magic: The Gathering, but in most cases it’s not obvious when a game gives players too many choices. The example from Magic: The Gathering seems obvious—it just feels like too many choices for the player. But why? What’s the harm in too many choices?
In turn-based games, the most obvious and apparent problem with having too many choices is something called **analysis paralysis**. This condition manifests itself clearly in multiplayer board games, as other players can wait a long time for the current player to take his or her turn. In other games, it's a lot less clear when there are too many options. The damage done by having too many options is usually that each option starts to lose uniqueness, and the game starts to blur into a somewhat arbitrary guessing match of tiny decisions that have little meaning. Much of the **weight** of decision making is lost under these conditions, even though it's less apparent.

This relates to our earlier discussion about the essence of design: elegance. Elegance is doing a lot with a little, and giving players dozens of options for each thing they can do usually entails a lot of inherent complexity. Having 20 guns, or cards, or moves that a player can do is probably a bad thing. For instance, in *Street Fighter* each character has dozens and dozens of moves, all of which can be performed at any moment during play. Extreme *Street Fighter* fans will tell you that every single one of those moves matters—and at the highest levels of competitive play that's probably true, as any small advantage can mean the difference between winning and losing—but the reality is that many of the moves serve the same purpose to varying degrees. The result is that many of them never get used, because they do the same thing less well than some other move.

This speaks to the real problem with having too many options in a game: in any given game, there are only a small number of meaningful things you can do. In *Street Fighter*, for example, your real choices might be attacking high, attacking low, blocking, throwing, jumping, and shooting a projectile. But attacking high alone includes ten or so different options for performing it. The reality is that at least a few of those options will be simply not as good as some of the others in performing the real choice of attacking high.

Good game designers understand what the real choices in their games are, and usually limit the number of in-game choices to be similar to the number of real choices in the gameplay. They know that when a game has too many choices, many of them will be false choices.

**Efficiency**

Do not, under any circumstances, waste any of your players' time. Players' time should be absolutely paramount, and you need to be doing everything in your power to deliver as many interesting, cool decisions to them as you can per second of play. Keep in mind that they're probably quite busy, and have taken not only some time out of their days but
also some money out of their wallets in order to check out some of your ideas. Giving them chores or waiting times is completely unacceptable. If you have screens that take a long time to load—and by long, I mean more than a second or so—find a way around it! It’s so important that players not wait that art and programming should be restructured to avoid long loading screens.

In video games, players’ time is most often wasted via no-brainer actions such as grinding or other false decisions. Level geometry is almost always much bigger than it needs to be, forcing the player to run down long hallways over and over again. If your game includes something like a town with various NPCs (non-player characters) whom you can talk to, ask yourself what the purpose of the town is. If its only purpose is to buy and sell items, for instance, perhaps a text menu could replace it. Let the player get right to the meaningful stuff.

Board games are usually a bit more respectful of players’ time, due to physical constraints and the fact that adding wasted no-brainer actions makes games annoyingly fussy, but there are still examples of places where they can tighten up. The genre most frequently responsible for being inefficient is the war game, which tends to have a good amount of no-brainer actions and maps that are too large. This is done for the sake of simulation, but if you look at these games through our lens, they come up short in this area.

**Take Nothing for Granted**

FPS games have guns. Platformers have scrolling. Fighting games have asymmetrical forces. Dungeon crawlers have loot. Video games have achievements, cutscenes, quick-time events, RPG elements, chest-high walls, combos, etc. People on the Internet debate the characteristics that make a good boss fight, as though all games are so similar that what works for one game should work for all (which, sadly, is almost true right now). One of the assumptions that I dislike the most, and that I think many indie game developers are guilty of, is that video games should have jumping. But it doesn’t have to be this way: you should start from scratch and ask difficult questions no matter what kind of game you’re making. Creativity sometimes means being destructive—destroying old ideas and expectations, and building new ones.

I think that my game *Auro* is a good example of this kind of creative destruction. It’s a turn-based, randomly-generated dungeon crawler. When I started designing it, I wanted to make a roguelike game that was similar to my previous game, *100 Rogues*. But soon after I began the
design process, I started to see really massive, fundamental ways that I could change things.

The first thing to go was equipment. Roguelikes and RPGs always have a system for you to find or buy equipment for the characters. The problem is that this system is inherently unnecessary: it's just an extension of your level (at level 10 you get the level 10 sword, and then you have to equip the character; at level 20 you get the level 20 sword, etc.). Of course, if there aren't level requirements and a level 1 character can equip a character with a level 20 sword right off the bat, then forget about balance—it's just a big mess. Instead, I decided to render equipment like swords and armor as special abilities you could get in a special discipline skill tree. So you just take the sword skill, and bammo—you have a sword!

Then I started thinking about the classic experience and leveling-up systems. Most RPGs have a huge problem in that infinite grinding is possible (and not only possible but required in many of the games). Roguelikes put a cap on grinding through the food system, which, while functional, has never really satisfied me. This system works by having a food clock that is constantly counting down, and you either have to eat or starve to death. Usually, food can only be found by moving forward in the dungeon. There are some problems with this system: it's relies too much on randomness to give the player food, and it only puts a soft cap on grinding instead of preventing it.

I also started to question the idea that you get stronger as you go. In most of these games (my own 100 Rogues included) your characters' stats grow as the game progresses. But does this really make sense in terms of game design? The game should be getting more difficult, so why am I making my job a million times harder by having the player's power change over the course of the game? If anything, in some ways all RPGs tend to get easier as they progress because of the increasing stats. I'm sure we can all think back to many RPG experiences that ended with our characters simply being immortal demigods: this is the logical conclusion of a system that makes your character get better as you go.

So I ditched that, too. Your characters stay at the same levels of health and attack damage as they go through the game. Instead, they just learn new abilities as they go and face more monsters with an increasingly wide array of abilities. I also ditched the scales that monitor health and damage throughout the game—you can do that if characters aren't simply getting more powerful. Once I did that, it made sense to ditch those sword and armor skills as well and swap them out for more interesting abilities that expressed something similar in a way that was deeper
and more sensitive to the context. For instance, I added an ability called *counter*: you cast it, and the next time you’re hit with an attack or special ability (or both) they’re combined and reflected back on the opponent. This is an inherently more interesting way to render *reduction of incoming damage*, as opposed to the usual platemail armor that just reduces incoming damage across the board.

Ditching increasing stats is a great example of taking nothing for granted. I think that when you take this approach to game design you’ll find many things about modern video games that simply do not make sense. The classic idea of leveling up was included for purely thematic and fantasy simulation reasons, but we’re making games here.

**Becoming an Expert**

No matter what kind of game designer you are, you can learn from other kinds of games. A digital-game designer has a lot to learn from board games, sports, and even other disciplines that aren’t directly related to games. One of the most damaging effects of the isolationism of the digital-game industry is duplication. Most of us in the digital-game world tend to think of digital games as the only *real* games, and this explains why so many modern digital games are so similar to each other. We can’t imagine something that we’ve never seen before. Creativity is the act of combining and modifying things already seen or experienced—you cannot create in a vacuum, you can only create using the pieces of information that you have available to you. The rewards of becoming an expert are huge for a game designer.

If you want to be a game designer of any kind, you’d be well advised to be an expert not just in digital games but in all kinds of games. In fact, I’d go so far as to say that you are drastically limiting yourself as a game designer if you aren’t looking outside of your immediate medium.

The following are some examples of areas that all game designers should be looking at. I also recommend reviewing the games mentioned in Chapter 3.

**Designer Board Games**

This is the single greatest category of games available for someone who is interested in learning about new game mechanisms. Designer board games are a celebration of the concept of *game* as I define it. Since the 1990s there has been something of a renaissance in the world of designer board games, which may be related to the fact that their creators put a lot of pride into the practice of game design. Indeed, these games are
known as designer board games because of their practice of including the game designer's name on the front of the box. This category includes many subgenres, only some of which I will address. In Chapter 5 I'll go into much more detail about these genres.

- **War games.** This is one of the oldest genres of games, as I mentioned in Chapter 1. War games tend to be extremely complex, long, and gritty. They usually straddle the line between wanting to be a game and wanting to simulate a conflict, and commonly are set in a real place or even simulate a historical battle. The nature of war games tends to keep them from being among the most elegant of games, but there's certainly a lot you can learn from them. The war game genre also includes the subgenre of tabletop war games, such as *Warhammer 40K*.
  - Check out: *Advanced Squad Leader*, *2 De Mayo*, and *A Few Acres of Snow*.

- **Abstracts.** Abstract games are games that have minimal or no theme. They're entirely representational, and usually use a grid and basic shapes in basic colors to visually represent territory or other mechanisms of a game. They're often two-player games and their play frequently has low levels of randomness. Abstracts are especially useful for game designers because of their complete and total focus on mechanisms. If an abstract game's gameplay isn't at least slightly new or interesting, it sticks out like a sore thumb. That said, abstracts can be a bit more difficult to get into than some other kinds of games due to their lack of themes.
  - Check out: *Go*, *chess*, *Arimaa*, *Blokus*, and *Hive*.

- **Eurogames.** This is my favorite category of board games because they are heavily mechanical like abstracts, but with usually just enough of a theme to draw players in. Most of the notable Euros tend to come out of Germany, which is generally considered to be the board-game capital of the world. These games often have themes relating to farming, trading in the Mediterranean, or the medieval period, but what's notable is that Eurogames tend to specifically avoid direct player conflict, putting them in stark contrast to the category of war games. Another thing I personally love about Eurogames is that they are very elegant and often minimize the element of luck (few Euros have dice). In terms of elegance they perhaps are one step down from the abstracts, but they also tend to do a lot more than most abstracts.
  - Check out: *Puerto Rico*, *Through the Desert*, *Agricola*, and *Caylus*.
Chapter 2. On Game Design

- **Ameritrash.** The term *Ameritrash* started out as a pejorative term, but eventually was embraced by the community and has now mostly stuck. The name came about because the games being described were mainly of American origin with a lot of components. Ameritrash games tend to ship with a whole lot of plastic. They also tend to be thoroughly thematic—even driven by theme in many cases. Almost every Ameritrash game comes with at least a few dice, and many come with a dozen different dice to use in different situations. Ameritrash games seem to have evolved out of the tabletop and pen-and-paper gaming fields, oftentimes being more tightly packaged *D&D* (*Dungeons & Dragons*) or *tabletop lite* experiences, but they’ve also come into their own in recent years. It’s worth noting that Ameritrash games seem to have the most in common with modern video games: heavily thematic experiences with a big focus on production values.

  - Check out: *Arkham Horror*, *Battlestar Galactica*, and *Chaos in the Old World*.

**Card Games**

While there is some overlap between this category and that of designer board games, there’s also a family of games that are played with regular playing cards. In fact, this category of games is so huge that going into it is well beyond the scope of this book. Subgenres of card games include trick-taking games, bidding games, and gambling games, to name a few. It’s a genre of games with an extremely rich and vibrant history. I highly recommend Scott McNeely’s *Ultimate Book of Card Games: The Comprehensive Guide to More than 350 Games* as a wonderful starting place for those who want to get more acquainted with the world of card games.

  - Check out: *Tichu*, *euchre*, poker, and Reiner Knizia’s *Money*.

**Pen and Paper Games**

There is a huge world of pen and paper games, quite possibly because they are easy to make (at least in terms of the material needs of production). I recently visited The Compleat Strategist, a game store in New York City, and was completely stunned by its collection of books, manuals, maps, and other materials relating to pen and paper games.

Pen and paper games often attempt to do something that I don’t think is the job of games: to simulate a world or interpersonal experience. With that in mind, game designers can still learn something from P&P games since they are interactive systems that usually do have goals.
and are often very game-like. They're a great place to look for inspiration for a new digital-game mechanism. As I pointed out in Chapter 1, they're the bridge between board games and digital games—you should know about these games for that reason alone.

- Check out: Dungeons & Dragons, Pathfinder, and Paranoia.

Sports

I don't need to explain the social significance of sports in the life of a modern human being. You can't go anywhere without seeing professional baseball games on television or seeing something about a football victory in the newspaper. And yet, many of us draw a somewhat arbitrary, clear line between games and sports. Those of us in the game design world tend to think sports are not really games—or if we do consider them games, we don't really think to analyze them. But the fact is, we all have a lot to learn from sports.

Sports are probably the oldest form of game playing, and depending on how you define sport (we all agree golf is a sport, right? Then is croquet a sport? How about billiards? Skee ball?), the range of mechanisms is huge. Moreover, people don't realize that there are officials who address balance issues and rule changes for sports every year, particularly in the case of American football.

A look into the history of how the rules of American football evolved over the years yields an enormous number of lessons for game designers. For instance, Rogers Redding, who officiated NCAA football for many years, has talked about some of the unintended consequences of one particular rule change in that game: requiring hard shell helmets. He believes that while this rule was added with the intention of protecting players, it actually may have had more effects than that. One effect may have been that players now move faster and more recklessly. The irony here is that because players feel well protected, they may make worse decisions at higher speeds, causing more serious injuries. As game designers, we all know too well that adding one new rule can have the same kind of unforeseen consequences.

Game designers can also learn a lot from the structures and measuring systems used in professional sports, such as the different types of tournament and league setups, the ranking systems, and the systems for metrics. Learn to play a few sports—and don't rule out sport-based video games, one of the last bastions of true gaming in digital games today!

- Check out: football, soccer, tennis, and golf.
Children's Games

While most children's games will not fascinate or capture the imagination of the average adult, it's definitely worthwhile to know your stuff about them. One reason to know about children's games is that you can see very clearly how games can break down depending on the intelligence of a user. We all had fun playing Candy Land as young children, but it's hard to see where that fun came from now that we have minds that are more developed and a better understanding of game mechanisms.

Another reason to know about children's games is to absorb their lessons of simplicity and ease of use. Children's games don't do a lot, but what they do, they do with elegance, since this is of utmost importance with children.

• Check out: Chutes and Ladders, Candy Land, and Whoowasit?

Video Games

I think a lot of us think of ourselves as video-game experts, but there is really so much to know about video games beyond what is mainstream. Look to old DOS, Amiga, Apple II, or Commodore 64 games. Look up weird Korean web games. Visit abandonware websites like Home of the Underdogs and click on games randomly for hours on end. Read the articles posted on great game-history sites like Hardcore Gaming 101. The Japanese have a habit of not releasing some of their best games in North America for the last 20 years, and looking at these games can also be extremely eye-opening. There are even some very worthwhile television shows and YouTube channels that should be looked into. Less well-known but rich genres such as MUDs (multi-user dungeons) and roguelikes are other examples of games that have a lot to teach us. And don't forget to check out Chapter 4, where I go into detail about various video-game genres. There's a ton to learn about video games beyond popular modern console and PC games.

It should be obvious, though, that no one ever fully becomes an expert. Nevertheless, it's an ideal that we should work towards: the important thing is to make a conscious decision to go down that path.

Related Disciplines

If you want to become a great game designer, it's worth taking at least a brief look at related disciplines. Some of these fields are more related to game design than others; the ones listed next are from most related to least related.
Chapter Three

WHAT IS IT GOOD FOR?

So, for the first time in the history of the videogame form, people who aren't programmers or corporations can easily make and distribute games. But why would they want to? Why make a game—especially when there already exist the means to write stories, play songs, film yourself for YouTube? What can we do with games that we can't do with those forms?

To begin, let's define what a game is.

You've played games and you have assumptions about what they are. Maybe when you read game you imagine a videogame; maybe when you imagine a videogame you imagine a big-budget run-jump-shoot game. Maybe you imagine Tetris. Since I'm more interested in games, digital and otherwise, that don't resemble games that already exist, I think a fresh definition is in order. I also think it's worthwhile to have a definition that isn't specific to digital games, because I'm interested in the commonalities between digital and non-digital games, and in connecting videogames to that much older tradition.

So here's my definition:

A game is an experience created by rules.
That’s pretty broad, huh? I’m interested in as inclusive a definition as possible, though you might argue that mine is too broad: for example, you can use it to describe getting stuck in a traffic jam or paying your taxes. A tax form is nothing but a series of rules you follow to produce a final number, after all. But is it useful to think about your taxes as a game? Not really. Do the rules on a tax form really create a strong experience, or are they just a method for producing a number?

A game is an experience, and that experience has a certain character. Maybe a game is a story, or maybe it’s the experience of control giving way to panic giving way to relief. Maybe it’s about taking something and making it grow bigger and bigger, or maybe it’s about two rivals, equally matched, each trying to out-guess the other’s plans. The experience that we identify as a game has character, and we can talk about what that experience is.

And if we’re discussing an experience, then that implies someone is there to have that experience, someone we refer to as a player. We can’t talk about a game without talking about the experience of the player playing that game, even if the playing experience we’re talking about is often our own.

The experience we call a game is created by the interaction between different rules, but the rules themselves aren’t the game, the interaction is! A game can’t exist without a player or players: someone needs to be engaging with the rules for the experience to happen.

How does that work? Consider a game of Tag. Rules: One player is IT, and must tag as many of the other players as possible with a touch. Each of those other players is SAFE when she touches this gnarled-up oak tree. You can see the way the interaction between those two rules creates an interesting (and volatile) dynamic. The players who aren’t IT want to
reach the tree, but the player who is IT wants to stop them.

You can imagine a situation where the IT player is standing between two other players—one to her left, one to her right—and the SAFETY of the tree. Maybe one of them will make a break for the tree, maybe IT will be forced to pick one of the two to chase while the other gets to make a run at the tree, maybe a fourth player will take advantage of IT’s distraction to make a run at the tree from behind. When we talk about a game of Tag, we’re talking about this experience. But this situation (and it’s a good, tense one) isn’t explicitly defined anywhere in the rules. However, notice how these rules guide the creation of that situation. The rules set the players in opposition to each other, give most of the players a goal, and give the other player a reason to intervene, creating a tense dynamic.

What if we were to take either of these rules away: the SAFE location or the player who’s IT? Without a SAFE location, players have no reason to stay nearby and interact with the other players, especially the IT player. The ideal strategy to avoid IT would be to go as far away as possible, and that breaks the tension and hence the experience of the game. What if there was no IT player? Then it’d just be people running around, and while a bunch of people running around has value, it doesn’t have the character or dynamic of a game.

But there’s certainly room to change the details of the rules. Tag, being a folk game, has been played by many people in many places with many, many different versions of the rules. In one version, a player might be done once she’s tagged the SAFE tree. As more and more players tag the tree and leave the game, the players who are less fast become greater and greater targets because the IT player can focus less on monitoring the tree and more on pursuing them.
Alternately, what if a player who touches the tree isn’t permanently safe—what if players are only allowed to be in contact with the tree for five minutes at a time? That keeps players vulnerable to IT and keeps the game from stagnating. Maybe a player who leaves the tree has temporary immunity to allow her to get safely out of IT’s sight, or maybe it becomes a stand-off, where the escaping player has to wait for another player to distract IT’s attention before she can make a break for it.

What about freeze tag? In this case, a player who’s tagged by IT is “frozen” and has to wait for another player to come and “rescue” her before she can move again. This variation has much more direct interaction between the non-IT players. Instead of just depending on one another as decoys, they have to actively put themselves at risk to aid other players, which only adds to the tension of the game. And it creates a new dynamic between the non-IT players: I rescued you this time, but if I get tagged you’re going to have to leave the tree and rescue me.

And that’s what games are good at: exploring dynamics, relationships, and systems.

The Story of Tetris
A “system” is what we’ll call the interaction (or ongoing interactions) between a set of rules. Let’s talk about Tetris now.
What are the rules of Tetris, essentially? The basic rules that drive Tetris are:

The game is played with pieces, comprised of every possible combination of four squares. (See the image above.)

- Pieces fall continuously into a well of a certain volume. The player can guide the pieces' fall to the left and right of the well, and also rotate the pieces both clockwise and counterclockwise.
- Pieces are removed from the well when and only when the player organizes them into complete rows.
- If there is no room left in the well for a new piece to fall, the player loses.34

You can see how these rules create a system where the player's mistakes compound on one another to cause further mistakes: Only full rows are eliminated, so incomplete rows stick around and take up space in the well. Clutter in the well then makes it more difficult to position other pieces and to create rows. As the row fills with mistakes, it eventually
becomes impossible to fit more pieces, and the game ends.

These rules function in tandem to give the game a momentum and shape: the player makes errors that cause further errors, until eventually the player is overcome. (And consider how well a commonly added rule, "the pieces fall faster every time ten lines are made," works with these basic rules to help the game escalate.) We could consider this a system.

All games aren't necessarily simulations of existing systems: it would be difficult to imagine a situation in the world that actually resembled Tetris. But it's easy to imagine simulations that model systems of rules that are far less abstract: urban planning, politics, oil drilling. And there are games whose rules mimic such systems. Will Wright's SimCity is a game in which the player plans a city, Jim Gasperini's Hidden Agenda is a game in which the player governs a post-revolutionary South American nation. Arch D. Robison's Seismic Duck models the way drillers use aimed sound waves and seismogram to find oil reservoirs.

You can begin to see how systems can be translated into game rules: a commercial zone in SimCity, for example, needs people to act both as a work force and as consumers. That means the people need homes to live in, transportation to get them around the city, power to make sure the lights are on. The system teaches concepts about the interdependency of urban forces. To again cite Greg Costikyan's "Maverick Award Speech": "I want you to imagine a world in which the common person is no longer ignorant of economics, physics and the functioning of the environment—things which are themselves interactive systems—because they have interacted with them in the form of games."

Every game of Tetris has the same shape—errors compound on errors until the well is filled and the player is
overcome—because the system of rules we’ve discussed guides the experience in that direction. But the player places all the pieces herself. Every player will place the pieces differently, will play a different game, but experience a similar result. The same holds true for any system of rules, as simple as Tag or Tetris or as complicated as SimCity. Games have a lot of potential for examining the relationships between things—or, rather, for allowing the player to examine the relationships between things, because the player does not merely observe the interactions; she herself engages with the game’s systems.

The Rise of the Designer
Tag is an example of a folk game, along with Go, Chess, Poker, Stickball, Hide and Seek, and most of the world’s oldest games. Games have been around as long as civilization has; the game is by no means a new form or a recent invention. What is relatively recent is the shift from folk to authored games. Folk games, like folk songs and folk texts such as the Bible, have no single credited author, but rather many untraceable authors over many years. They’re artifacts shaped by entire cultures, and generally they can tell us a lot about those cultures.
For example, compare Chess, a continental European board game of warfare, with Hnefaftafl, a Viking board game of warfare. Chess is a game of combat between kings with equal resources. Each player has the same pieces and starts in the same position on opposite sides of the game board. Each player’s goal is to capture the other player’s king. In Hnefaftafl, one player represents a king and his defenders, who start in the center of the game board. The other player represents the attackers, who surround the king’s forces on all sides of the board. The king player’s goal is to get the king through the attacking hordes to safety, while the other player’s goal is to surround and capture the king. The differences between these games’ interpretations of combat tell us a lot about the differences between strategic thought between European vassal kings and Viking warrior bands: their priorities, the nature of their battles, and whether they approach warfare as a platonic war between equals. And the games themselves, in turn, shape the strategic thought of those who play them.

Our history is full of folk board games. Authored board games—games created by a single person or small group, and whose authors can be identified—are a more recent phenomenon. For example, I can tell you that the board game Cosmic Encounter was designed in 1977 by Bill Eberle, Bill Norton, Jack Kittredge, and Peter Olotka of Eon Games. (We can date Cribbage, by Sir John Suckling, to the 1630s.) These are games as texts of specific rules, rather than as patterns of rules that are subject to change through mimicry. A game of Tag will always have a chasing player and a safe position, but the actual rules will change from play to play. The majority of contemporary board games are designed by a single author or team, and the same is true of digital games.
Can there be folk videogames? Videogames retain credits better than board, card, and physical games. I think that there are digital games, though, that exist as patterns of similar rules, perpetuated through duplication with small mutations. There are a thousand different versions of Tetris, for example, each coded by one of a thousand different authors, and each version with a slightly different set of rules, a slightly different set of numbers, and often (to avoid litigation) a different name. There's a digital game that's commonly known as "the snake game," which began as an arcade game called _Nibbler_ by Joseph Ulowetz and John Jaugilas. In this game, the player directs a snake to gobble pieces of food. The snake dies whenever it crashes into either a wall or its own body by coiling around itself. Each piece of food causes the snake's tail to grow longer, making it take up more space and making it more difficult for the player to avoid collisions with her own body. So many different authors have remade this game on so many different machines that all of its forms and variants are usually just referred to as "the snake game." Is this how authored games become folk games?

But what can authored games tell us that's different from folk games? Folk games tell us about the culture that created them; authored games tell us about the author that created them. Authored games have the potential to be more personal, and thus more specific and diverse, than folk games. Two plays of an authored game are likely to be more similar than two plays of a folk game, because the authored game retains the rules set created by its original designer. It's the fact that folk games change with each player that makes them so long-lived, that makes them adapt to suit the culture that adopts them. But in this book, it's authored games, and the diverse set of voices they embody, that I want to focus on.
What's Video Good For?

In a board game, players have to track how much money is left in the bank, which pieces are in play, how high the water level rises. A deck of cards can keep players from knowing in what order pieces will come into play, dice can generate random outcomes to situations, and players have hands of cards that represent information they keep from the other players, but beyond these basic devices, little information can be hidden from the players, because the players must make sure the rules are being observed by tracking most of the information themselves.

In digital games, the computer keeps the rules. The computer tracks all the numbers. Digital games therefore have much greater control over what information the players have access to, making videogames capable of much greater ambiguity than board or card games.

What's ambiguity good for? Telling stories! Digital games have great potential for storytelling. The author has a lot of control over the pace at which information is revealed; therefore the author can pace the telling of a story. This is not to say that videogame stories are being told as well as they could be. But the format of a videogame—which lets rules be changed and introduced over the course of the experience, and which lets the author hide the causes for events and show only the effects—lends itself more easily to an overt, sustained narrative than any physical game format.

Because the rules are kept by the machine, the rules in digital games tend to be more numerous and more subtle. Think of a game like Shigeru Miyamoto and Takashi Tezuka’s *Super Mario Bros*. Unless you’ve studied the game in great detail on a technical level, you probably don’t know exactly how high Mario can jump relative to the height of the screen, or how
What Is It Good For?

fast he accelerates horizontally when he runs. The interactions between these hidden rules in videogames can result in very complex systems without necessarily complicating the game, because the player isn’t required to track and compare all the numbers. For example, imagine the designer creating a situation where there’s a tiny platform with a long pit on either side. Mario has to run to build up the momentum to clear the pit and land on the platform, but instead of stopping there he needs to immediately jump again in order to make the second pit without losing the momentum that will let him cross it. This is a problem that wouldn’t be obvious to someone who had just approached the game.

Through playing the game, the player develops a sense of the limits and subtleties of these hidden rules. This interaction between the player and the game, dependent on the game’s hiding information, gives digital games their special capacity for subtlety and nuance. You could compare it to the use of “English” in a physical sport: the difference between hitting a ball and hitting it with a particular force, and in a particular direction.
Because of this capacity, videogames are often performative: they allow the player room to interact with rich and complex systems with grace and finesse. We usually refer to this as "skill." A system may persist through an entire game, but the game may start very permissive of less graceful playing and require the player to play with more and more finesse as the game goes on. The game gets HARDER, asking that the player become more skillful, but allowing her to learn the game's systems over the course of navigating increasingly difficult situations.

The systems that the player manipulates in *Super Mario Bros.* are introduced very early in the game, with the only added rules coming with the periodic introduction of new enemy characters or hazards. But the situations that Mario has to navigate start fairly relaxed and demand more and more skillful playing as the game progresses. In the first stage of the game, obstacles are low enough that a simple jump from a standing position will allow Mario to clear them. In later stages, the height of obstacles will require Mario to run and build momentum before jumping, in order to jump higher. In this way the designer teaches the player the subtleties of the game's complex system through careful use of machine-controlled variables. Digital games are thus good at teaching, and at communicating a sense of the player's progress, which often parallels the progress of the protagonist and the development of a story.

What else is handy for telling a story? The ability to generate or play video and audio, either as accompaniments or as central vehicles for information. Digital games can incorporate a variety of media when telling their stories. Consider how the music in *Super Mario Bros.* speeds up when there's only a hundred ticks left on the time limit to complete a stage, creating a
sense of urgency, or how the sound played when Mario jumps on an enemy gets higher and higher pitched, indicating that a reward—in this case, an extra life—will come if the player keeps doing what she's doing. Consider how the player's journey takes her through a changing visual landscape, from a sunlit field to a black-and-blue underground, to treetops, to the mushroom forest, and to Bowser's castle, and the way each of these sights—withheld from the player until her skill develops to give her access to later areas—provides a sense of progression through the Mushroom Kingdom.

I don't mean to imply that non-digital games are incapable of the things I've described, or that digital games are in some absolute sense better or more worthy of interest. There are many different kinds of games, all of them suited to different things. Digital games, because of their ability to withhold and pace the player's access to information, because of the strict narrative control the author is able to have over the player's experience (because the machine enforces the rules), and because of their capacity for generating a wide variety of sights and sounds to enhance or even define the playing-out of the rules, are particularly well suited for the telling of stories. And the telling of stories—games becoming more personal—is what especially interests me about games as a form.

**Role-Playing Games**

Digital games have certain strengths for telling stories, but
CATALOGUE OF OBSOLETE ENTERTAINMENTS
by Adam Pennyman

GAME: PAC-MAN
Format: Coin-Op Arcade Machine
Manufacturer: Midway license of Japanese Namco property
Year: 1980
CPU: Z80 3.072000 MHz
Sound: Namco mono (1 channel)
Screen resolution: 288 x 224 pixels

The most universally recognized of the arcade machines, Pac-Man's central icon is the player's avatar, his on-screen representation: the game's eponymous, voracious yellow three-quarter circle. By removing a simple pizza slice, Namco game designer Toru Iwatani breathed life into the simplest geometric form, turning it into a snapping mouth, lovable... but hungry, always hungry, all the time chomping with want just like the player it represents. The Pac-Man must eat its way through the 240 dots and four Power Pill energizer dots that line his blue, bilaterally symmetrical maze, while dodging (or, when under the fleeting influence of a Power Pill, eating) the game's antagonists, the four Pac-Man ghosts.1

The Pac-Man's insatiable hunger for the dots and Power Pills that fill the corridors of his maze-worlds suggests weighty parallels, such as the ravenous hunger for More Life that Darwin saw in all species, any one of which would overpopulate and overrun the earth if not for the predatory ghosts of natural selection. Also, we are reminded of Marx's "need of a constantly expanding market" that "chases the bourgeoisie over the entire surface of the globe" (Communist Manifesto) with the "vocation to approach, by quantitative increase, as near as possible to absolute wealth" (Capital), casting the Pac-Man in the

1 Pinky, Blinky, Inky and Clyde are undeniably cute, cuter than the Pac-Man himself: the first time the author played the game as a fat ten-year-old boy with microwave pizza grease on his fingers at Ed's Convenience Mart in Woodhill Grove, Illinois, his virgin Pac-Man lasted all of ten seconds as he instinctively moved to connect with them, somehow trying to assimilate their cuteness and their all-seeing eyes into his blind yellow proxy.
role of corporate antihero in a utopian fantasy where the agents protesting his unfettered domination of the maze-world actually defeat him in the end. Obvious metaphors, lurking just beneath the surface of the game.

Suspiciously obvious. These kinds of interpretations belie the poverty of imagination that has become all too typical of practitioners of the interpretive arts. If Pac-Man and the games that followed in its wake mean anything to us, if they are central switching stations through which thousands of our most important memories are routed, it is our duty to dig deeper.

To us, the Pac-Man’s lives appear short, cheap, and relatively inconsequential once we discover the overwhelming importance of sex and money. But if we perform a thought experiment and try to occupy a Pac-Man’s subjectivity, we will realize that these three short spans are not so short to him. We must allow that each dot eaten takes on a meaning for the Pac-Man that we can barely fathom.

I suggest that if we, through force of imagination, were to dilate time to experience it as the Pac-Man does, and increase the resolution to allow us to read as much into each pixel as the Pac-Man must, we would not see the identical dots as identical at all. When the microscopic differences in each pixel are made large, each dot will possess a snowflake’s uniqueness, and the acquisition of each—no, the experience of each—will bring the Pac-Man a very specific and distinct joy or sorrow. The dots all rack up points equally, of course; in retrospect, however, some are revealed as wrong choices, links in a chain of wrong choices that trace out a wrong path leading to a withering demise beneath the adorable and utterly unforgiving eyes of Blinky, Inky, Pinky or Clyde. As anyone who ever played the game seriously must know, the order in which the dots are experienced is of great importance. For each labyrinth, there are rigid and precise patterns through the maze—i.e., specific sequences of dot acquisition—that, if followed with a samurai’s unwavering, arrow-into-hell certainty, allow the knowing Pac-Man to ascend from level to level with Zen ease and deliberateness.

An often-overlooked, seemingly minor feature of the game has implications which, once unraveled, are more radical than anything
heretofore discussed. In the middle of each maze, on the left and right sides of the labyrinth, there are two identical tunnels that lead off the borders of the screen. These tunnels are connected, with the left tunnel leading to the right, and the right to the left. In itself, this disappearing off one side of the screen to reappear on the opposite side broke no new ground. In Atari’s Asteroids, for instance, a player’s ship can do as much.

When an Asteroids ship leaves the screen, however, it reappears on the other side instantaneously; thus, the three-dimensional space described by Asteroids’ two-dimensional screen is a continuous, perfect sphere. In Pac-Man, this is not the case at all. When a Pac-Man disappears into one of the off-screen mid-maze tunnels, there is a lag of about a half second before he reemerges on the other side. Assuming his speed remains constant, we can extrapolate some other-dimensional space of approximately six dots’ length that the Pac-Man must traverse each time he goes through the off-screen tunnel. Were it not for the pursuing ghosts, he could remain in this off-screen space indefinitely.

In its evocation of an unseen world beyond the rectangle of the seen screen, Pac-Man forces us to reckon with a space that is real, yet never experienced directly, empirically. An area where no points can be earned, yet one crucial to the successful completion of the higher-level screens. The truly tapped-in player never forgets the off-screen tunnels, like a religious man with one mental foot planted firmly in the hereafter.

Pac-Man is the world’s first metaphysical video game. Like a black hole’s event horizon, the impassable barrier of its CRT screen hides a richness we can speculate about but never experience directly. What happens in its unseen regions? Perhaps the laws that reign there are not the brutal laws of the maze. Perhaps the tunnels move through an endless Valhalla of energizer dots with no ghosts in sight, tantalizingly close, if only we could break free.

There is a world beneath the glass that we can never know.
Rules of Play
(All of Chapter 15)
4.2 Characteristic: Snowball and Catch-Up

Many games, especially multiplayer games, have “catch-up features”: features whose purpose is to help losing players catch up, such as the shells (missiles) in Mario Kart that let you shoot at the drivers ahead of you. And many games naturally have a tendency to “snowball”: once you start winning, you win more and more due to your initial advantage, such as the ability of a winning Monopoly player to use her money to buy even more advantage. In Chutes & Ladders, one can think of the chutes and the ladders as a catch-up feature—the viewpoint is slightly problematic given that it is not obvious the chutes hurt the leader more than the other players, or that the ladders help the loser more than the other players (more on this later), but surely if one player were twenty squares ahead she would vote to get rid of all the chutes and ladders if she could, and the players who were far back would vote against her. And any political game tends naturally to exhibit catch-up in the form of “pick on the leader” and sometimes snowballing as well in the form of “eliminate the weak.”

Figure 4.2
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But if one thinks about catch-up and snowball features a bit more, it becomes quite tricky. Suppose you’re way ahead of me. But the game has a lot of catch-up features. Then I still have a chance to win. Well, then perhaps you are not so far ahead of me after all. (For example, a twenty-square lead in *Chutes & Ladders* might be basically the same as a five-square lead in the equivalent game without the chutes and the ladders.) Or, if the game has a lot of snowball features, then you are even further ahead of me than it seems. In either case, how meaningful are the ideas of “catch-up” and “snowball” at all? If we both understand the game well, we understand that you are however far ahead of me you truly are, and “catch-up” and “snowball” are illusory.

There is partial truth to this idea that catch-up and snowball are illusory. But it will take us a fair amount of untangling to sort out what is really going on. We will start by looking at some more examples of snowball and catch-up. Then we will give a more precise way of defining the terms, look at how those more precise concepts reveal the illusion, and examine how that illusion relates to the perceived realities of games. Armed with our new (and hopefully more enlightened) viewpoint, we will look at a number of issues surrounding snowball and catch-up.

Figure 4.3
Is A really ahead? And if so, by how much?
More on Snowballing

Any game in which your score (either in the sense of official score that determines the winner, i.e., victory points, or “unofficial” score in the sense of a simple and easy to use metric, such as money) equals your power tends to have snowballing. *Monopoly* is a classic example; more money helps you to make even more, until you are unstoppable. In no-limit poker, having a high score definitely increases your power. Chess can also be viewed this way, if you think of “score” as your lead in pieces. On the flipside, in go a territorial lead does not typically help you make even more territory. Players often trade away territory for power, in the hope that that power will allow them to get even more territory later in the game.

In most sports, having a lot of points doesn’t really help you score more. You can’t “spend” a touchdown you made in football to get a new player. Boxing is one of the few exceptions (and indeed boxing is also exceptional in having an explicit snowball-handling mechanism: early ending of fights by the referee). In a PvP computer game with experience points and leveling up, snowball is the rule: win a few fights early, and you will be higher-level and win even more fights later on (*Defense of the Ancients* being an extreme example). In an RTS like *Starcraft*, if one thinks of army size, or army size plus economy size, as a kind of score, then one certainly sees snowballing.

Another natural effect that increases snowballing in some multiplayer games arises from players’ reaction to randomness (although randomness itself is generally a catch-up feature; see below). If a game has a lot of uncertainty, knocking out a losing player can be beneficial to the winning players. His elimination means he doesn’t have a chance to randomly get lucky later and defeat one of the leaders. Poker is a common example: players who are ahead in no-limit poker are typically happy to knock out a player in a worse position.

Snowballing is often considered bad by designers and players. Partly this is just a natural feeling of unfairness: why reward the player who is already winning? A more sophisticated point of view is to think of it as a problem in logical elimination. Nobody thinks it “unfair” simply because a game ends and someone wins it. What’s bad is when someone who has little or no chance to win is forced to continue playing for a long time before the game is over. So a snowball feature that directly leads to the end of the game might be a fine thing (and in fact might not be perceived as a snowball feature at all, but simply as a mechanism for determining when the game is over).

6. Power meaning your ability to make the game go your way—your ability to affect the overall game state.

7. “Having points doesn’t help you score more” is true here only to first approximation. Certainly one could argue that there are psychological gains from being ahead that might lead to scoring even more points: momentum, demoralization of the other team, and so on. But that’s nothing compared to the advantages of being able to put hotels on all your property in *Monopoly*.
Less appealing is a snowball feature that pushes the game to a state where the winner has an even higher chance of winning, with the game still nowhere near its conclusion.

One way to limit snowballing is to unlink power and score, say by adding victory points that are used to determine the winner but that cannot be spent or otherwise used during the game. Sports and European boardgames commonly use this technique. The price of limiting snowballing in this way is often a more complicated game (gold and victory points as in many European boardgames rather than simply dollars as in *Monopoly*). Race games have this feature naturally: you typically can't "spend" your lead in the race to buy anything, so your lead in the race is simply a specialized and intuitive kind of victory point. In fact, many physical races have something like the opposite of spendable victory points in that not only can't the leader "spend" her lead, she is often harmed by her lead position due to air resistance and the ability of nonleaders to draft.

Although designers largely tend to look for ways to limit snowballing, there are often good reasons to increase it. If games are dragging on too long, or the game suffers too much from player-elimination issues, adding snowballing effects can be helpful. Rewards for knocking out a player (as in *Risk*) are one example.\(^8\) These are strictly speaking snowball effects—they make losers lose by even more—but it's often better to have a 0 percent chance to win (and thus be able to go get a cup of coffee) than to have a 1 percent chance to win (and thus be forced to remain in the game with almost no chance for victory). Games that use the "eliminate the winners" mechanic (e.g., a footrace, or the card game known variously as Asshole, President, or Dai Hin Min) are similarly snowball games—once you drop out, you are no longer in any danger of being the loser.

**More on Catch-Up**
The dynamic of the rich getting richer means snowballing tends to appear naturally in games. By contrast, catch-up features are more often deliberately included, and less often appear as natural outcomes of game features put in for other reasons.

There are countless examples of deliberately added catch-up features in games. The shells in *Mario Kart* fire forward, so the person in the lead can't make use of them, but people who are behind can fire on those ahead of them. And the Spiny Shell specifically homes in on the person in first place. Some racing games go so far as to speed up the car of anyone who is behind. In *Warcraft III*, the upkeep tax on large armies is a catch-up feature limiting the snowballing effect of large-army dominance.

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8. As mentioned above, some games (like poker) have these rewards naturally so they don't need to be added. In *Risk*, though, the odds of an all-but-eliminated player coming back and winning are fairly small, so encouraging the knockout blow makes sense.
As mentioned above, any game with voting or other political features will typically thereby have catch-up, sometimes to the point of making “in the lead” a meaningless concept for much of the game. If someone has a clear lead, it is in the interests of all the other players to stop him. Note that this kind of catch-up is especially agential—one playgroup may think it is fine to pick on the leader, but another may impose limits on it (similarly for political snowballing—various groups will be for or against knocking out weak players, say). But politics is surely a net catch-up feature, since picking on the leader in some form is all but universal in political games.

In general, randomness may be thought of as a kind of catch-up feature. Although a random event may not differentially help losing players over winning players, change in the game state is still appreciated more by the players who are losing than by those who are winning.\(^9\) Reset buttons are one example: if a player is losing in a race game, she is happy to play a card that says “everyone goes back to Start,” or that scrambles everyone’s position around randomly. Note that although scrambling everyone’s positions at random is in some sense “treating all players equally,” it can only help the person in last place and only hurt the person in first. Even a seemingly equitable random jolt like “each player rolls two dice and moves forward that many spaces” is probably better for someone who is behind.

**Expansion and Contraction of Win Probabilities**

Saying that “each player moves forward a random number of spaces” is a catch-up feature is perhaps counterintuitive (although the fact that the player who’s behind is in favor of it is evidence in favor of this viewpoint). And we still haven’t addressed the question of how meaningful catch-up is once you take it into account: if I’m way behind you in *Chutes & Ladders*, but I might roll a 4 and land on a ladder and wind up ahead of you, then I’m not really so far behind you after all, am I? To address these issues, let’s try to be a bit more precise about what catch-up and snowball really mean by creating a simple mathematical model of the progress of a game over time.

At any moment in a game, we can write down each player’s chance to win. Typically those chances will start out more or less equal (for a fair game), change somewhat over the course of time, and then gradually shift toward 1 (for the winner) and 0 (for everyone else).\(^10\) If we write the various chances for each player in a row, say for a

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9. Indeed, a basic strategy common to all games with a certain minimum amount of skill is to look for highly variable lines of play when losing, and to try and make the outcome as simple and straightforward as possible when winning. Bridge is perhaps the supreme example—when losing, assume various low-probability distributions of the cards in an attempt to find some chance to win; when winning, try to find a line that succeeds no matter how badly the cards are distributed.

10. Readers with some knowledge of mathematical modeling will realize that, like most models, this one comes in a discrete-time and a continuous-time variety. We ignore such issues here, although with its emphasis on events, our model is essentially a discrete one.
four-person game that lasts ten turns, we might see something like (0.25, 0.25, 0.25, 0.25) at the start of turn 1, (0.3, 0.2, 0.15, 0.35) on turn 4, and (0.9, 0.03, 0.03, 0.04) on turn 9. We'll call this list of numbers a state vector. Note that the sum of the numbers is always 1.

If there's no chance involved at all (i.e., the game is completely determined), then the vector will look like (0, 0, 0, 1, 0)—all 0s for the players who have no chance and 1 for the player who is certain to win.

In a two-player game, if I am 70 percent likely to win at a certain point (perhaps it's a simple race game and I am eight squares ahead), and then later I am only 60 percent likely to win (perhaps you've rolled well and I'm only five squares ahead now), then you have caught up. If instead later I am 95 percent likely to win, then that's a snowball situation relative to the earlier game state.

What we're really looking at is the spread of the state vector: as it spreads out, the game is snowballing toward its conclusion. If the player who is behind catches up, the vector will be less spread out. The standard way of defining spread is by the variance: the expected sum-of-squares deviation from the average. The average is just the sum of the values divided by $n$, so for a state vector that's $1/n$. Thus for a state vector $(p_1, \ldots, p_n)$ the variance is

$$[(p_1 - 1/n)^2 + \cdots + (p_n - 1/n)^2]/n.$$  

This number represents how far the state $(p_1, \ldots, p_n)$ is from the "most caught up state" $(1/n, \ldots, 1/n)$. Naturally, the state $(1/n, \ldots, 1/n)$ has the smallest possible variance, namely 0. The largest possible variance belongs to vectors like $(0, 1, \ldots, 0)$—the most extreme snowball states.

So we'll define a catch-up event as one that decreases the variance of the state vector, and a snowball event as one that increases the variance.

It should be mentioned that ending state vectors like $(0, 1, \ldots, 0)$ represent a game with a unique winner. Some games, however, end in draws, thus ending with minimum

11. By "chance" we mean uncertainty in the outcome of the game, not overt chance elements like cards or dice. In this sense, even a game of chess has chance—in fact, quite a large amount of chance between two evenly matched players, for whom the state vector in the early game might be something like $(0.47, 0.53)$. See section 5.1, on randomness.

12. Note that the number of squares until the end of the race factors into the probability estimate of each player's chances, in addition to the number of squares one player is ahead of the other. For concreteness, you might like to imagine the race as two players taking turns rolling a single die, with the winner being the first player to reach 100 total points.

13. The square root of the variance is called the standard deviation, and is another common measure of spread. The variance is more convenient for our purposes—it's easier to compute with—but it conveys essentially the same information.

14. $(n-1)/n^2$, not that it matters for this discussion.

Exercise 4.26: Compute this.
rather than maximum variance. This also happens in games with scaled victory conditions, for example poker, where the ending state of the players can be any redistribution of the total buy-in one likes.

Note that hurting the player in the lead and helping the player who is behind are exactly the same thing in this model: if we go from (0.7, 0.3) to (0.6, 0.4) we have both hurt the leader and helped the follower. Any increase in one player’s chances must represent a decrease in the chances of some other player(s). Similarly, in a snowball event, the leader does better as the person behind does worse.

Thinking about games in this manner abstracts away a great many features, but a surprising amount of the flow of the game can be read from the time history of a player’s chances to win. Some examples:

Here’s a three-person game that progressed in a typical fashion (figure 4.4). One player (the thick black line) started out with a $1/n = 1/3$ chance to win, fell a bit behind, started winning, and then continued to widen his lead until the end of the game.

In the two-player game represented in figure 4.5 our player took a modest early lead, but eventually lost the game.

Figure 4.6 shows what a player’s history might look like in a highly political game (perhaps the chip-taking game), where none of the early choices matter because an apparent lead results in getting “picked on.” The player represented by the thick black line may have gained a lot of points early on, or he may not have, but none of that affected his chances to win. Each player had about as good a chance to win as any of

![Figure 4.4](image)

Typical win
Figure 4.5
Typical loss

Figure 4.6
Only the end matters
the others throughout most of the game. The winner of this game was determined entirely at the end.

This same graph might also describe a game with extremely strong catch-up features—for example, a race game where cars behind the leader are given a significant speed boost.

In this unhappy game (figure 4.7), our player (the solid black line) was beaten down about halfway through the game. At that point, she had almost no chance to win, but she wasn't actually eliminated until the very end of the game. (Perhaps it was a race game in which she was so far behind that she had no real chance to win.)

**Catch-Up: What Is Apparent and What Is Real?**

One might ask the question of what part of catching up is real and what part is illusory. Imagine a game with an easy first-order state heuristic like a race. The game has a "catch-up mechanic" that helps people who are behind. Players enjoy playing because they feel like they can catch up if they fall back and remember pleasurably the number of great comebacks they have seen. But if players understand how this mechanic works, they should adjust their heuristics and when they evaluate their chances to win (i.e., use their new state heuristics) they will find there is no catching up from behind in the race—in fact there is no falling behind and never was, at least to the extent they once believed. It just means that a large lead on score really represents a small lead in chance to win.
Real catch-up features can come in two types. The first type is features that put some limitations on how big the variance can get (until the very end) and how fast it can get there. The second type is features that tend to reduce the variance in ongoing games by having events that either end the game in favor of the leader or reduce the variance going forward. For a simple example, consider a duel, with two duelists shooting in turn, each with a 60 percent chance to hit (which ends the duel). At the start, the first shooter has a greater than 0.6 chance to win, but if he misses, the other shooter is now ahead. Many games have features that work in this manner: the player who is ahead must press his advantage and attempt to win quickly lest the other player catch up.

It's true that for games with a unique winner, it is common that catch-up is the apparent catch-up that comes from imperfect state heuristics, not necessarily “true catch-up” (if one thinks of “true catch-up” as variance control). But that's okay. It is important to remember that since it is rare for players to have perfect state heuristics, it may be true that there is no reason to draw a distinction between a “true” versus “apparent” catch-up feature. When a catch-up feature is put in, by and large what is happening, as we have stated, is partially actual variance control and partially catch-up relative to a particular heuristic—for example, the lead in Mario Kart. The feature's effect is one of muddying the heuristics, but as long as those heuristics don’t change, for all practical purposes the effect is real—the player who thinks he is far behind thinks he is catching up. The danger lies in players developing new heuristics, perhaps seeing that there is no catch-up but instead only a nonintuitive ranking of the leaders, and placing themselves back into the state the designer was attempting to avoid—namely player dissatisfaction with their ability to come back from behind.

Catch-up features can still do good things:

- Sometimes skill can be used to apply the catch-up feature if you are behind (or avoid it if you are ahead).
- Catch-up features allow a nice first-order heuristic (score/position without the catch-up feature considered) and a more advanced second-order \[16\] heuristic. Since climbing the heuristic tree is a big part of the enjoyment of games, that's no small thing.
- Catch-up features keep more players in the game in the sense that they have a reasonable chance to win. In other words, catch-up features slow down the spread of the

15. And we'll generally just say “catch-up” from now on, since there's no point in making the distinction any longer.
16. Strictly speaking, it may not be first-order and second-order. It may be third-order and seventh-order, say—“first-order” and “second-order” are a stand-in for “lower-order” and “higher-order.” Heuristics don’t have absolute numbers associated with them in any case; at best one can say that a certain heuristic is more advanced than another (typically by taking the other one into account, along with additional information).
state vector. The catch-up feature may also put a cap on the variance of the vector until just before the end. (To see this is true, just consider a game with some catch-up feature, and delete that feature partway through the game; now the players’ chances to win are as far apart as they would seem with the simpler heuristic, which is further apart than they would be with the more complex heuristic, i.e., with the catch-up feature implemented.) In fact this may be the most important true catch-up function—that at no time until the very end will any player have too great a chance to win. Features like this often work better if player heuristics do not fully take this lack of variance into account, so that players feel exciting “comebacks” are common.

- Catch-up features with the “maybe it fires, maybe it doesn’t” coin-flip type event (the missile that hits or misses) make the point lead more random-seeming, make it change more, and make the typical game more exciting for most players. Pushed to extremes, this can backfire with some sophisticated players, who realize that the point lead is such a bad indication of the true game state that they lose interest in it—a race where nobody cares who is in the lead is probably not an enjoyable game. Worst of all is if there is no useful state heuristic left whatsoever.

- Catch-up features can have the real quality that at any time the state vector has too high a variance, the game will either end or shrink the variance. This effect is very important since generally the harshest problem of having a small chance to win isn’t losing itself, but rather playing a game where one has too low a chance of winning. There are catch-up features that consistently deal with this problem by ending games or making them fairer. Either way is often a gain for the player behind, especially in a noncompetitive game.

Despite all these positive features of catch-up, it is worth remembering that it is often easy to see the bad in snowballing, but not the good (control of game length, better player-elimination characteristics), and the good in catch-up features, but not the bad (poor positional heuristics, relative irrelevance of early-game choices, opportunity for kingmaking because the last-place person has more power, overly long games).

Miscellaneous Catch-Up Topics

Now with more perspective under our belts, we can tackle several issues involving catch-up and snowballing.

Randomness and Catch-Up

Stirring the pot (e.g., resetting everyone’s scores to the starting score, or adding a random amount to everyone’s score) is somewhat like what people tend to think of as catch-up, and somewhat not: it doesn’t differentially help losers and hurt winners, but it tends in practice to hurt winners and help losers simply because the winners are ahead and the losers are behind. Events of this kind tend to be “catch-up events”
in the sense of decreasing the variance in the state vector when they happen (compared to the variance of the vector when they fail to happen). So one can think of random elements in a game as being in themselves a kind of catch-up feature—if a game has a lot of randomness, you are probably not as far ahead as the score (or other first-order state heuristic) might indicate.

Random features in a game often give rise to “press-your-luck” situations: cases where a player can choose to make the game more random or less. Typically a player chooses to make things more random when behind, less random when ahead. Hail Mary passes in football, going for three-point shots in basketball, guessing in *Clue*, or pushing for a risky *Yahtzee* combination are all examples, but perhaps the ultimate example of a press-your-luck game is Sid Sackson’s boardgame *Can’t Stop*.

**Over-Catch-Up**
Sometimes catch-up features are so strong that it is better to be second, or at the very least it does not hurt to be second. Race games with lots of ways to hurt the leader, shoot the person in front of you, speed up if you are behind, and so on, can have this problem. Highly political games tend to be this way, due to the “pile on the leader” tendency almost all playgroups have. Over-catch-up tends to be frustrating—people *want* to pump up their score, or get ahead in the race, and they do not want to be punished for it. In theory, jockeying for second (or should it be third?) and then jumping to win at the end can be a reasonable game, but in practice it is not much fun if it happens all the time. And games of this type tend to have all the play choices other than those near the very end of the game be irrelevant to the outcome.

A game with this attribute will generally become less fun when players realize it.

**Catch-Up in Very Long-Running Games**
Catch-up can take certain unusual forms in games that go on for a very long amount of time—typically one and a half player games (like single-player RPGs) or MMOs. Long one and a half player games tend to have a great deal of catch-up: if one thinks of the basic metric of player level compared to stage in the game (for an RPG), then grinding is a mechanic that lets the player freely “catch up” anytime she wants. The same applies to an MMO.

The reason very long games require catch-up is that if a game lasts ten hours (say), then without some form of catch-up, a losing player would be clearly losing for the last several hours, which is just too long to be in a state of all-but-certain loss. Of course, if the catch-up features are extremely strong, one gets the problems one often sees in these genres: choices in the early stages of the game may not matter very much, or the player may be discouraged on realizing that a painstaking and tedious method of play is most likely to guarantee victory. One common attempt to solve the problem of catch-up in very long games is to use dynamic difficulty adjustment. This basically
amounts to catching up the player invisibly whenever she falls behind, and catching up the AI if the player moves ahead. The problem is that it is rather like your spouse cheating on you: arguably fine if you know nothing about it, but liable to make you feel bad if you do find out about it, which eventually you will (at least in the case of games, given the Internet). Players who are trying to play well want to feel that if they do play well, they will be rewarded. This feeling is hard to come by if the game tries to ensure equal outcomes regardless of player skill.

Even for games with a short game length, one can think of the ongoing metagame as a corresponding game with very long game length. This very long game has some of the same issues—for example, if a dozen people all learn to play chess together, as time goes on their skill levels will spread apart. After a number of months, some of the players may be in a permanently winning or losing state. Those players have (all but) won or lost the have-the-most-skill metagame, leading to a bad play experience. Better players in the group teaching weaker ones provides a sort of catch-up feature, arguably analogous to level grinding (the weaker players are spending more time improving their skills, the stronger players are spending less).

**Targeting and Catch-Up**

A catch-up feature may hit various targets: it may hurt the leader specifically, the player of your choice, the guy in front of you, a random player, everyone but you, everyone in front of you, and so on (likewise for catch-up features that help a player, although “help yourself” is by far the most common sort). Depending on whom the catch-up feature targets, different gameplay effects can occur. We’ll give just a few examples of problems that can arise, especially if the catch-up feature is too strong.

Hurting the leader often tends to lead to over-catch-up and a “play for second” style of game. Each player hurts the leader, nobody else gets hurt, and thus the lead cycles regularly, but having the lead isn’t necessarily meaningful. There are no choices, so the only skill increase comes from the disguise of the first-order “who’s ahead” heuristic, a heuristic that may be so heavily damaged as to be almost useless.

Hurting your choice of player tends to lead to highly political games. As with any targeting mechanic, carried to an extreme it may result in a chip-taking game.

Hurting someone near you (in whatever sense the game defines “near”: a player sitting adjacent to you in a boardgame, a car driving near you in a racing game) can be good in that it is less political, although of course it does represent some diminishing of player choice. However, such a mechanic—say the Green Shell in Mario Kart (which, being unaimed, typically is used against players who are close)—may not give large-scale catch-up. Instead, it may cause clumping: groups of players who are close together keep shooting each other, forming clumps, but one clump can’t affect another far-off clump (although occasionally a player will break away from one clump and
push ahead or fall behind until pulled into the orbit of another clump). In this sense *Mario Kart* is almost exactly like a large bicycle race, with the Green Shell playing the same role as drafting: something that pulls together nearby vehicles but does not affect faraway ones. They are a catch-up feature within a given clump, but less so when viewed from the point of view of the race as a whole.\(^\text{17}\)

**Conclusion: Limitations and Effects of Catch-Up**

The limitations presented on catch-up are interesting for both player and designer. The most critical of these is the idea that catch-up relative to a fixed state heuristic is real even when the situation relative to winning percentage is not. Any time a player is in a game that he perceives to have a catch-up feature, there is some indication that his state heuristics may be insufficient and there is a possible gain in strategic understanding to be had by altering them. Similarly the designer needs to take care that adding a catch-up feature relative to a state heuristic continues to serve the basic intention of keeping players excited and hopeful without eliminating some core element of the game. It is probably true that you don't want to naively add a catch-up feature to maintain player hope at the expense, for example, of actually wanting to be in the lead in a race, or gather the most power in a political game. While the simple state heuristic of the lead being good in a race is arguably more important than keeping all players involved, there is often a lot of leeway for players maintaining naive state heuristics depending on the player audience. It is much more likely that adding a catch-up feature to a race for children or casual players will be seen as a true catch-up feature relative to the lead heuristic, rather than causing a shift in player heuristics to devalue the lead in favor of a more complicated formula. Even for a more hardcore game, features like dynamic difficulty adjustment may cause players to believe they “caught up” due to good or lucky play when in fact the existence of the feature meant they were never really behind. This situation can break down in a game meant to be highly replayable as players refine their state heuristics. Few players are interested in a game where they see they always have a 50 percent, or even 95 percent, chance of winning no matter what they do.

True catch-up in the sense of limiting state vector variance has an important place as well. Very often this will achieve the goal of continuing player involvement while maintaining clean first-order heuristics. The difficulty here lies in the potential to disenfranchise competitive players who may feel slighted they can only be a limited amount better than a truly bad opponent. Again the audience is the key. A feature that limits a player's downside to 1 percent of the leader's chance to win may not go

\(^{17}\) This whole clumping phenomenon only arises if the outcome of the catch-up affects future targeting, as in a race game with missiles. If the two are unlinked, as in a card game where you can only affect players sitting next to you, the clumping won't happen.
far enough to keep many people interested in the game. Conversely, a feature that
sets that limit at 40 percent may scare away more competitive players.

Catch-up features that either end games or make them fairer can work especially
well in achieving the basic goals for player hope in a long game. They may have the
tendency, however, to create a lack of control over the length of the game, since by
their nature they achieve their leveling by ending some games early. Still, it is encour-
aging for many to know that there are no bounds on how good they can get at the
game while at the same time worse players will never have to be in a game they feel
they can’t win for long.

Exercise 4.9: Give some examples of pressing your luck in baseball and hockey.

Exercise 4.10: Give some examples of pressing your luck in a chess tournament.

Exercise 4.11: What types of audiences would be more interested in games with
catch-up features?

Exercise 4.12: Do games with catch-up features tend to have poor or good state
heuristics? Why?

Exercise 4.13: What are the risks of dynamic difficulty adjustment? Do all the risks
go away if no players know that the difficulty is being adjusted?

Exercise 4.14: For a game to have a “true” catch-up feature what needs to happen?
How might this be beneficial for the player audience? (Hint: Think about the elimina-
tion qualities inherent in such a game.)

4.3 Characteristic: Complexity Tree Growth and Game Arc

Game Complexity Trees
One can think of a game as a series of choices. In fact, the game designer Sid Meier
famously defined a game as “a series of interesting choices.” There are certainly
games with no interesting choices, and in fact examples of games without any choices,
but these tend to be limited to the sphere of gambling. For logical completeness, one
would typically consider all possible choices at any given node (decision point). But
from the point of view of human players, what matters is the number of meaningful
choices. “Meaningful” is of course an inherently agential concept: for the exact same
game state, a beginning player might be choosing at random (no meaningful choices),
an intermediate player might feel pressure to examine a great many choices, and an

18. This point of view is quite explicit in the Nash/Von Neumann game theory’s extensive form,
the definition of game in combinatorial game theory, or the game state trees one searches
through in a computer chess program.
THE BOWERBIRD'S DILEMMA

In the annals of male courtship display, the bowerbird is justly famed...

Not for his drab, meager plumage, but for the bower he builds: a great thing woven from twigs and leaves, and often decorated with shiny shells, coins, and parrot feathers.

I'm an artist, all right?

(Actually, there are at least 18 species of bowerbird, of which some three-quarters build a bower of one kind or another.)

At mating time, the female bowerbird visits each bower in turn, judging its merits while the builder warbles his longing.

Chortle yodel flirt

Flutter waggle

If she likes the effect, passionate bowerbird mating ensues.

So... Where's your gallery?

On that bower, naturally.

But then, while he's out marauding, his own bower is left defenseless... so what's the point?

Oh, for--?

Lugh.

Stakes are high! Some artistic males win dozens of mates, while others, after working like dogs, suffer rejection after rejection.

What critic?

Derivative...

No wonder, then, that besides building his own bower, a male also tries to ruin his neighbor's! In no time, he can do damage that takes hours to repair.

Hey! Haven't you heard of appropriation art?

They wrote equations for the number of matings--i.e., the payoff--a bird could expect under different conditions.

Pass the algebra book.

To estimate the costs and benefits of marauding behavior, Chicago ornithologists Stephen and Melinda Pruett-Jones turned to game theory, the branch of mathematics that computes the payoffs of competing strategies.
AND FILLED IN A MATRIX SOMETHING LIKE THIS (THEIR'S ALSO INCLUDED MORE TERMS SPECIFICALLY FOR DECORATION-STEALING, OMITTED HERE FOR SIMPLICITY):

THE EXPRESSION $E(M,M)$, FOR EXAMPLE, MEANS THE EXPECTED PAYOFF TO A GUARDER WHOSE OPPONENT IS A MARAUDER.

BIRD 1

G M
E(G,G) E(M,G)
E(G,M) E(M,M)

BIRD 2

G M
E(G,G) E(M,G)
E(G,M) E(M,M)

PLUGGING IN THE NUMBERS, THEY SAW THAT THE MODEL AGREED WITH REALITY UNDER TYPICAL CONDITIONS, MARAUDING PAYS OFF BETTER THAN GUARDING AGAINST EITHER A GUARDING OR A MARAUDING FOE.

SOME HYPOTHETICAL NUMBERS:

G 5 < 7
M 2 < 4

SO FAR, SO GOOD—EXCEPT FOR ONE UNSETTLING FACT:

IN SHORT, $E(G,G) < E(M,G)$
$E(G,M) < E(M,M)$
BUT ALSO $E(M,M) < E(G,G)$
ALAS?

THIS PARADOX, CALLED THE PRISONER'S DILEMMA, IS A HOT TOPIC IN GAME THEORY... WHEN PLAYED REPEATEDLY, IT SEEMS TO CALL FOR A FLEXIBLE STRATEGY BASED ON YOUR OPPONENT'S LAST MOVE...

O.K... O.K... LET ME TRY TO THINK THIS THROUGH...

WHAT'S A BOWERBIRD TO DO? SCIENTISTS AREN'T SURE... ASIDE FROM SOME PARTIAL OBSERVATIONS, NO THOROUGH STUDY OF INDIVIDUAL MARAUDING DIFFERENCES HAS BEEN DONE...

I'M GOING TO LEAVE YOU ALONE UNTIL YOU MESS WITH ME!
I'M GOING TO QUIT THE GAME AND BECOME A MONK...
I'M GOING TO ATTACK ANYTHING THAT PUSHES MY ANGRY BOWERBIRD BUTTONS!

BIRDS! BIRDS! WE'RE ALL VICTIMS OF THE SYSTEM! WHY CAN'T WE JUST AGREE TO LIVE IN PEACE?

HEY, C'MON, YOU MEN! LET'S SEE SOME FEATHERS FLY!!

BUT RESEARCH CONTINUES!

HEY!! WHO MESSED UP OUR PAPERS?

GET OFF!! WE'RE TOO STUPID!
Rules of Play
(All of Chapter 19)
Rules of Play
(Chapter 27 up until “Procedural Characters”)
In late 1981, Dr. Alan Kay recruited me into Atari Research and challenged me to dream. Most people take a lazy approach to dreaming. They put their feet up on the desk and engage in idle mental forays for half an hour, and they call it dreaming. To me, dreaming is a much more deliberate and difficult process. Dreaming is hard work!

I see dreaming as occupying a middle ground between fantasy and planning. A fantasy is the free indulgence of human desire, unconstrained by the limitations of reality. A plan reduces human desire to a pedestrian statement of objective, and then posits a sequence of steps that will attain the objective. Fantasy springs from human desire, where planning hews to reality. Dreams live in the gray zone where fantasy merges with planning. Where a fantasy spreads its wings and soars off into space, and a plan plods along earthbound, step by bitter step, a dream takes a running start and leaps as high as it can to gain a handhold by which to hoist itself up.

Fantasies and dreams both create alternate universes. A fantasy's alternate universe is unconcerned with the real universe. It is a desirable universe, but not an attainable one. A dream creates an alternate universe that is both desirable and attainable. That requires the dreamer to sketch out all the ramifications of his dream, to create a complete and consistent universe. A fantasy universe can be fragmented or inconsistent, because human desire is often fragmented and inconsistent, but a dream universe cannot be so self-indulgent. A good dream universe is a
complete image, not a partial sketch. Every detail of the ideal is clearly specified, every consequence worked out. Only when we know precisely where we're going can we begin planning how to get there.

So, under Alan Kay's prodding, I set to work on my dream. It took me a year and a half to give it form. I wrote the first edition of this book, *The Art of Computer Game Design*, as part of my process of forging my dream. By 1983, I had my dream:

I dreamed of the day when computer games would be a viable medium of artistic expression—an art form. I dreamed of computer games expressing the full breadth of human experience and emotion. I dreamed of computer games that were tragedies, games about duty and honor, self-sacrifice and patriotism. I dreamed of satirical games and political games; games about the passionate love between a boy and girl, and the serene and mature love of a husband and wife of decades; games about a boy becoming a man, and a man realizing that he is no longer young. I dreamed of games about a man facing truth on a dusty main street at high noon, and a boy and his dog, and a prostitute with a heart of gold.

What elevated these thoughts from fantasy to dream was the identification of the central problem: the concentration of computer games on things rather than people. I wrote an essay entitled "People, Not Things!" in which I bemoaned the fact that all computer games were about things, not people. "You chase things," I noted, "and things chase you. You acquire things, expend things, utilize things, shoot at things, but it's always things, things, THINGS! There are never any real people in our games!" My goal was clear: I must perforce design a game about people.

But how? Given the wimpy hardware available to me in 1982, I had difficulty imagining a game about people. So I got down to basics. If the game is about people, it has to be about their behavior. More specifically, it has to be about their behavior toward each other. After much random flailing about, I hit upon the earliest expression of Crawford's First Rule of Software Design (Lesson 43).
The answers to this question tell you everything important about the design. The user's choices and actions lie at the essence of any software design, not just games. You can describe a word processor in a thousand ways, but the best description provides a list of what the user does: type words, edit them, and print out the results. The user of a spreadsheet enters numbers and formulae, and then fiddles around with those numbers and formulae to explore various scenarios.

My little rule, simple as it might be, offers vast utility. It can sniff out a design error in a flash. Pick out any piece of badly designed software and ask the magic question, and you'll get an answer that reveals the fundamental flaw. The old checkbook balancing programs of the early 1980s were utter failures, but the personal financial management programs of the 1990s were big successes. Why? Because the checkbook balancing programs allowed the user to do nothing more than enter the amounts on bank checks and then print out the results—that's not much better than doing it by hand with a calculator. The personal finance programs, in contrast, allowed the user to enter all financial data, categorize it, prepare budgets and compare them with actual spending, and use the data in tax returns. These are useful things to do, which is why many people like to use such programs.

And so I asked myself, "What should the player of a people-style game do?" The obvious answer is that the player should be able to do social actions with other people. So what do people do to and with each other? The answer to this question is as vast as the range of human culture, so I needed to find some clean, simple subset of
human behavior, some set of actions that form a closed set of actions. After much trial and error, I hit upon the answer: gossip. People love to gossip about each other.

Of course, gossip is a complex behavior requiring the use of language; there was no way I could get the full range of gossip behavior into a computer. But I could get a tiny subset of it in place: the declaration of affinity. A great deal of gossip boils down to statements of affinity: "I like Jane," "I hate Tom," and so forth. Such statements have a pronounced effect on the listener, serving to alter the listener's own affinities. After all, if your best friend tells you that he likes Mary, then you are likely to be more favorably inclined toward Mary.

Even at this simple level, gossip behavior offers all sorts of interesting possibilities. For example, it works in reverse: If your best friend tells you that he hates Mary, then you are likely to be less favorably inclined toward Mary. And if someone you loathe is Tom's best friend, you are likely to be less favorably disposed toward Tom. This behavior also feeds back to the speaker: If your best friend tells you that he likes Tom, then your estimate of his friendship will diminish.

This can all be summarized by a simple statement: "People like people who like people they like, and vice versa versa versa." (I put in the extra "versas" to cover each of the different "likes" in the statement.) The idea can also be presented in mathematical form:

\[
CA [\text{Listener, Speaker}] = \frac{DA[\text{Speaker, Object}] \times A[\text{Listener, Object}]}{K1}
\]
\[
CA [\text{Listener, Object}] = \frac{DA[\text{Speaker, Object}] \times A[\text{Listener, Speaker}]}{K2}
\]

where

- CA is the change in affection.
- Listener is the person hearing the gossip.
- Speaker is the person speaking the gossip.
- Object is the person being gossiped about.
DA is the declared affection.

A is the absolute affection.

K1 is some constant greater than one, say, 10.

K2 is some different constant greater than one.

Now, these are simple differential equations, but they apply individually to each member of an entire group of people, and so the overall behavior of this system of equations can be complicated.

All the hard work lay in getting up to the point where I realized that gossip restricted to declarations of affection could provide the basis for a game. From that point forward, it was easy. I wrote a quick version in BASIC in one day; it lacked graphics, but the game was playable. Much tuning would be required, but the gameplay seemed solid. It was a ridiculously simple game, but then, so was Pong. This game was to people-games as Pong was to videogames.

AI

I had an excellent play-mechanic in hand, but now I needed some AI to control the computer people. How were they to respond to the gossip they heard?

At this point, it is worthwhile to point out the obvious: The solutions I describe never came quickly. I can't remember the many trials and errors I pursued, but there were quite a few. Weeks rolled by while I struggled with these problems. The gap between problem and solution in this book is often just a line of text, but in the real world it was much greater, and the eventual solution was nowhere near as clear as I present it here; most of the time I bumbled towards it in a reverse Drunkard's Walk (that's an old mathematical problem), eventually getting myself to the street light.

The solution that I eventually chanced upon relied, once again, on an analogy with the real world. In this case, I imagined the social system in the game to be rather like a set of springs tied together. Each person
With enough imagination, you can find models to solve any problem.

represented one node; seven springs, one for every other person, were tied to that person. Each spring had a "desired length" given by the affection that the one person held for the other. Now, if you tried to build such a system, you'd get a tangled mess, but in the pure mountain air of software, tangles don't exist. The idea is that each spring pushes two people apart or pulls them together; if you let the system "relax," the springs will all push and tug at each other until each person is in his optimal social position relative to the others. Good friends are close; hated enemies are far away.

This imagined environment could easily be simulated on the computer, and it suggested the solution: Each person should attempt to reduce the spring tensions around him. If one spring pulls him one way and another spring pulls him the other, he'll seek to release the tension by moving toward or away from somebody else. The calculation for all this is not difficult; it's a simple physics problem. So, with a snap of my fingers, the AI was ready to go.

Implementation Woes

I had just taken on a summer intern for my group; my intention had been to let him poke around with the other members of the group, helping out as possible. He had great skills as a graphics programmer and this little design needed nothing more than some graphics tacked onto it. Well, yes, it would have to be converted from BASIC to assembly language, but it was such a short program that I anticipated no problems. So I assigned the Gossip project to the summer intern.
Things went swimmingly at first. He had the game screen up and running in no time. There were eight people in two rows across the screen, each one shown with head and upper torso only (see Figure 19.1). They looked rather like the panelists on a game show. The person on the upper left was the player. Beside each player was a little telephone.

![Gossip main display](image)

19.1 **Gossip main display.**

I congratulated the student on his rapid progress, and suggested that he get to work on the algorithms, but he wanted to finish up the graphics first. So he went ahead and added the remaining graphics, as well as some delightful sound effects. The gameplay was simple: The player would use a cursor to designate a person to be called. Pressing the button would select that person, whose telephone would ring with an appropriate jangling sound and the handset jiggling on the telephone base. The person called would pick up the handset with a simple three-step animation, hold it to his or her ear, and say something like
"Air-oh?," which was the best that could be done with the primitive sound capabilities of the day. Then the player would use the cursor to designate another player, the one whom he wished to gossip about, and press the trigger button again. This would highlight that person; at the same time, the player's face would undergo a simple seven-step animation.

There were five of these animations. In one, the player had a big smile on his face and nodded his head up and down vigorously. The next, selectable by the joystick, had the player's face nodding up and down a bit less vigorously and with a merely pleasant smile. The third showed the player's face motionless with a blank look. The fourth showed the player frowning slightly, and nodding his head from side to side. The last showed the player looking quite angry, yanking his head from side to side most emphatically. The player would select the facial expression that reflected his feelings toward that individual, and then press the trigger button. One piece of gossip had been completed.

It looked and sounded really great; I was quite pleased. Just three weeks had passed and all that remained to be done was to implement the behavioral and AI algorithms, which, as I wrote earlier, were a piece of cake.

But my summer intern just couldn't hack it. Try as he may, he simply could not get a few simple equations to work in assembly language. Being a lousy people manager, I failed to intervene to walk him through the code problems; I simply couldn't believe that anybody could be so brilliant with graphics and so utterly incompetent with simple arithmetic. Pig-headedly, I urged him on with affirmations that the problem was trivial.

It's a measure of just how bad a manager I am that this situation persisted for three months before I finally put my summer intern out of his misery. I had figured that he'd go away at the end of the summer.
anyway, so I swept the problem under the rug. But he never did go back to school, and so I had to bite the bullet and let him go. Fortunately, he found a position elsewhere in Atari.

I turned the problem over to another subordinate who fixed it and got the program running in about a week. With a little tuning, we had the whole thing ready to ship within a month of the departure of the summer intern.

**Conclusions**

_Gossip_ had the bad luck to be published in 1983, just as Atari was beginning its death spiral. With all the chaos of the layoffs, jobs like publishing games proceeded at a snail’s pace and without much in the way of verve and élan. There is some question as to whether it ever appeared in the sales catalog; I myself don’t know. I don’t even know its sales figures; it seemed that, every time I called someone to ask, that person had been laid off. I’m sure it sold poorly; few people recall the game.

But _Gossip_ deserves a place in history: it was the first computer game about people instead of things. It opened up all sorts of interesting possibilities for further development. Games in which the gossip mechanics are extended to cover additional modes of expression. Games with larger groups. Games with gossip augmented by other dimensions of behavior. Sadly, nobody else ever followed up on these ideas; even today, the most people-oriented game on the market, _The Sims_, boasts a level of interpersonal interaction no higher than that offered by _Gossip_ in 1983.
Rules of Play
(Chapter 20 up until “Level Playing Field”)
Rules of Play
(All of Chapter 21)
In any conversation, we need someone to talk with. Without a player, a game is just a set of instructions, whether executed by a computer or human beings who learn what cards to draw on their turn. An unplayed game is like a piece of sheet music: you can see its potential and imagine what it might be like brought to life. You can grasp from notation or rules that it's complex and maybe glimpse its nature. Instructions need someone to carry them out to leap from untapped potential into a living, changing experience. To deepen our practice of playing games, we have to think about our own role in shaping what happens—and understand how our role as game designers intersects and tangles with the choices of players.
Players

My first real player was my little sister. I was around 12 years old when I discovered a digital game that let you design and play your own levels: the Macintosh version of Lode Runner (1984). It boasted a straightforward but deep system of climbing up ladders and racing across platforms, collecting bags of gold, running from nebulously defined enemies, and digging holes for them to fall into (see Figure 5.1).

I found the real magic of Lode Runner to be in the level-editing mode, which put the dozen or so objects of Lode Runner at my disposal. All of a sudden I was experimenting, creating scenes where the hero would be overwhelmed instantly by a horde of implacable enemies, or clamber and fall into a treasure chamber with hundreds of coins. I could create new scenarios that were completely unlike anything that came with the game; I could tell simple stories that played out in a series of twisty, challenging corridors.

When the player has collected every bag of gold in a level of Lode Runner, a new object often appears: a ladder that reaches to the top of the screen, allowing exit to the next level. In my own levels, I came up with new ways of using this suddenly appearing ladder. The space of the level would suddenly rearrange, and it would become clear that completing it required getting back across the dangerous level, being chased by enemies, to reach a previously invisible path. Suddenly I was creating plots with turning points!

Even though I could play those levels myself to see how they unfolded, there was something missing: a player, someone else who could experience the dangers and surprises I was crafting. I wanted to express something to someone, through this game. I wanted to see how another player would respond and if what I'd done would be clear. So I started using my 10-year-old sister as a guinea pig.
My sister knew how to play Lode Runner, and I'd make her sit in my well-warmed chair once I had finished creating a level. I'd tell her, "Go on, see if you can beat it!" She could beat my easier levels without much trouble, and although she had a big smile when she did, I felt disappointed somehow. I could tell that she was smiling in part because she'd beaten me somehow—as if I'd asked her a riddle and she'd managed to outwit me and find the solution with no help.

Before long I started creating fiendishly difficult levels for her to play: they required precise timing and exact knowledge of how to manipulate the movements of each enemy in order to win. These scenarios had lots of hidden trapdoors that looked like ordinary sections of floor but dropped the player right through them into certain death. I orchestrated the behavior of the enemies so that they'd start chasing the player at exactly the moment I wanted.

My sister would insist that these levels were impossible, and I'd smugly show her that they weren’t... well, as long as you had exactly the right skill, the correct strategy, if you knew the right path through the scene. As the designer, I possessed all the above, of course. I was thinking more like a player competing with a sibling, though, rather than crafting something for her. I wanted to beat her and see her admit defeat. That’s a natural impulse that I’ve seen play out many times since in games and levels made by kids for each other to play. But creating a system that’s practically impossible for anyone but the creator is just a tiny, tantalizing fraction of what we can do when we create games and ask others to play.

I was trying to create a harrowing experience for my sister, something with narrow escapes, unanticipated secrets, and perfect moments where a choice to run left or right made for an instant life-or-death difference. All the pieces were there, but with these fiendishly difficult levels, I hadn’t succeeded in engaging my sister, in showing her the magic I was trying to conjure. Eventually, when faced with a level full of tricks that were impossible to understand ahead of time, she rolled her eyes and refused to play.

Creating Conversation

So far, this book has talked extensively about the elements of vocabulary: verbs and objects, the pieces of context that aid in understanding those elements, and the ways those elements combine into scenes that develop verbs and create pacing. In the second part of the book, we look at some broader questions: why might you want to pace the development of a particular verb? What kind of story is conveyed when contextual elements, objects, and verbs work together... or against each other? What might you try to say with all that vocabulary? And how might you invite players to say something in response? Do you want to invite players to put their own stamp on your game, or are you trying to convey something that’s best understood if a player primarily absorbs and listens to what your game has to say?
We use the vocabulary of written and spoken language to communicate with other people. The vocabulary of games allows us to express ourselves in tremendously powerful ways, saying things with systems in ways that words can't. It lets us create different kinds of dialogue with each other. We're lucky to live in a time when expressive systems—another way of thinking about games—are being explored by creators and players in all sorts of new ways, to converse about and reflect on our every idea.

It's compelling to think of a game as a conversation: players make choices and use verbs within a system. In multiplayer games, these choices can communicate with other players. A single press of a button or move of a chess piece can convey aggression or uncertainty or less obvious concepts that are specific to a particular game. Players who are highly conversant in a system can read the moves of an opponent, whether human- or computer-controlled, and understand what's being said even without words.

As the creator of a game, you also participate in the conversation, but in an unusual and special way. Unlike the times I peered over my sister's shoulder and watched her play *Lode Runner*, you're usually not there to watch your players. Instead, you've facilitated a conversation by deciding many aspects of how it will work beforehand. As a game creator, you craft the particular vocabulary of its conversation, deciding how verbs will develop and shaping the space of possibilities in which the conversation will happen. As creators, we try to shape a space where a good conversation with or between players could happen; we hope that players won't throw their hands up in frustration and leave or get bored and drift away.

During a play session of a single-player game—the kind of game that's the primary focus of this book—all the conversation is happening between the creators of the game and the player. It's a tricky kind of conversation to have. As the creator, you have to hope that what you're saying in the conversation—through the rules and shaping of the experience as well as the words, images, or sounds you've added to the mix—gets across and finds a player, somewhere out there, who responds with choices, thoughts, and maybe even interesting strategies and emotional engagement.

This challenge can feel like a gamble, like sealing a letter in a bottle and hoping someone figures out how to open that bottle and understands what you wrote. If you're drawn to creating games—if you've ever felt the spark of excitement that I did when I started making *Lode Runner* levels for my sister—then maybe you have things to say which can't simply be expressed in words, but which could find a compelling form in the systems of a game. Take the gamble! The good news is that in recent decades, many others have gone before you. We've tried, failed, succeeded, and tried again. Despite the fact that we're all still learning exactly how to talk about games, finding words to use and models to think with, creators of games have found a lot of techniques and tricks to get our "letters in a bottle" read.
Iterating to Fun and Beyond

When I first started making levels in *Lode Runner*, I intuitively discovered one of the most pervasively used techniques for refining a game and fine-tuning the conversations that can emerge from it: I got someone to play it, went back and changed it, and made her play it again. Games need players, and as the participants in the conversation who might not be there when our games our played, we need to see people play and hear about their experience. Playtesting and iteration—the process of changing a game based on what you see and hear from the player during play—are the cornerstone of many creators’ process. After all, very few composers could create great works of music without ever being able to hear them; Beethoven, who lost his hearing, is the astonishing exception.

We playtest because we want to see a response to determine whether we’ve succeeded in eliciting the kinds of responses we were hoping for. Usually, the response a game creator is looking for is a smile, a look of intense concentration, the raised hands and lifted eyes that accompany a feeling of victory—all the hallmarks of someone who’s really into what’s going on and having fun. Playtesting lets us spot the barriers to reaching that place and then think about ways around those barriers. The barriers might include confusion about how to use a verb or pacing that’s too difficult for the kinds of players you’re hoping will play your game.

"Fun" is the most popular and traditional goal that game designers try to reach, however. Think about the metaphor of conversations again: talking with others, especially your circle of friends or other like-minded people, has often been described as one of the most consistently engaging and pleasurable things in life. That doesn’t mean that all conversations are fun. Some are deadly serious, even if they’re hard work to stay engaged with, and some conversations are necessary to convey important ideas. More and more, game designers are finding that fun is just the traditional role that games have played in society. We have to remember that it’s what most players expect of games still, but there’s a huge variety of other kinds of system-driven conversations that remain to be explored.

*Papers, Please* (2013) by Lucas Pope doesn’t try to present itself as a straightforwardly fun game. It tells you that you’re going to work: you play an immigration inspector, checking and stamping the documents of hundreds of would-be border-crossers (see Figure 5.2). You’re employed by a harsh, totalitarian regime that tramples on rights and demands your diligent and detail-oriented assistance in exchange for a meager stipend to keep your family alive. The scenario is grim and mind-numbing, and so is the gameplay: you’re literally inspecting paperwork for discrepancy, expiration, and forgery and stamping it APPROVED or REJECTED, over and over. For each mistake you make, you’re penalized, which could make a life-or-death difference for your inspector’s family.
This may not sound fun at all, on the surface—but *Papers, Please* manages to thoroughly express the workings of an unjust system that you find yourself trapped in when you play. You've got to decide whether to prioritize helping mistreated and threatened border-crossers or preserve your own family's health and wealth. The shape of the game—the difficulty and balance of costs and payment—always holds out the possibility that if you're good enough at your job, you can get away with some purposeful "slip-ups" to help people. Just as surely, your power to act is limited by the fact that you're only one cog in the machine.

Lucas Pope playtested *Papers, Please* extensively to fine-tune the workings of the game's fictional injustices. As one of the participants in the web forum where he posted early versions of the game, I took part in that process and saw the game get better at eliciting the kinds of feelings and experiences he was aiming for. Do all games benefit from playtesting, though? There's an argument that can be made that the goal of some games is less about persuading the player to respond, feel particular things, or make certain kinds of choices, and more about expressing something that the creator wants to say—regardless of whether a particular player is willing to hear it.

When we playtest and iterate a game, we make changes that attempt to adapt the game's form and the possible spaces that can emerge from it to the psychology and behavior of players. If we're making a game that's intended for young children, for example, we might change the controls so that they're easier for players with less developed reflexes and motor skills, or we might adjust the difficulty of the game differently than we would for an experienced gamer. We move the game away from purely being about our own expression to adapt it for an audience.
That’s not necessarily a bad thing, of course, but it means changing what we’re saying or how we’re saying it through game systems to attract, retain, or persuade players into hearing and engaging.

Your Conversation

What happens when game creators simply put their thoughts out there in an expressive system and ask players to listen without compromising or adapting? What if a game is trying to express something real about the creator’s life? As mentioned in Chapter 1, “Language,” Anna’s game dys4ia (2012) reveals her own experiences of taking hormones through dozens of small systems; it asks players to help unfold that story, piece by piece. dys4ia is a game that’s less about players choosing what happens or expressing themselves and more about a kind of listening through interaction to understand a kind of life experience that most players don’t share.

Telling and listening are part of conversations, too. Sometimes it makes sense to rest our active responses and simply hear what the person who’s talking is trying to say and understand what they mean in the stories they tell—or the systems they build. Games can present us with overt choices and ask us what we think; they can also show us that in some circumstances and systems, choices are limited or don’t necessarily make a difference. For example, as a single immigration inspector in Papers, Please, you can’t help every single person cross the border. When you play dys4ia, you can’t change the course of Anna’s life or experiment with the system to see what would happen if she stopped taking hormones or reacted differently to emotionally trying circumstances. It’s part of the story of her life, and it recounts through its systems what’s already happened.

When you go into a conversation, you help shape how it’ll evolve and turn out. Conversations can be polite and formal or raucous and free-wheeling; the same is true of games. As the creator of a game, even if you’re not present when it’s played, you’ll make many choices that determine and limit what might happen in the conversation of play. Games can present us with overt choices and ask us what we think—like an interrogator demanding answers or a friend posing questions to help us understand how we feel. What would you do in a difficult situation? What kinds of choices would you make when faced with limited resources? We can also create wider spaces within games where we invite players to come up with their own strategies, reactions, and explorations into territories that we might never have anticipated as the creators of the game’s vocabulary. Or we can limit those spaces and ask players to listen—to understand that not every system is open to being changed through the agency of players, not every story can be diverted toward a happy ending, and not every difficult challenge can be mastered and conquered.

These are all different ways of communicating through games, and they raise all sorts of questions. What kind of space do you want to shape? If you have something you want to say, how do
you get that across in a way that feels honest and true to players? How do you decide when to try to adapt to players’ expectations and psychology to try to elicit feelings of fun or persuasion, and when do you stop doing that in favor of holding on to your own expressions and just ask players to listen? If you’re inviting more open contributions to the conversation from players, how do you help them become conversant enough with our vocabulary to say something interesting in reply? Can we create space for a player to tell their own stories and express themselves in the space of a game, while also conveying what we have to say?

The brightest and most passionate game designers in the world continue to struggle with these questions because it’s exciting to explore a space with so much possibility that remains untapped. Although there are no definitive answers, the next few chapters share plenty of ideas about and around these questions. Maybe you’ll come up with some of your own answers.

Twenty years after I started experimenting with Lode Runner, I had a job designing games and another 10-year-old sister in my family. When I went home for the holidays one year, I brought my youngest sister one of the games I’d been working on. She was delighted and played it for weeks, mastering the intricacies of its system. She talked to me about it, asked me for help, and showed me her strategy. Inside the game, around it, and beyond it, we had a conversation.
Difficulty is one of the oldest ways to look at a player's journey through a game. A novice player usually starts with simple challenges: learn to jump over this obstacle, understand that pushing the joystick to the right will move her avatar to the right. Even in multiplayer games like chess or golf, a new player will often take on easy opponents: other novice players, or skilled players who are "taking it easy" on the novice by playing with a handicap or deliberately playing below their level of skill. As the player masters some simple verbs, she's faced with more difficult challenges.
Push and Pull

As a beginning designer making Lode Runner levels, I had a naive idea of difficulty: harder is better, and the ultimate challenge of playing any game is to master the hardest challenges. It's an upward narrative of progress and increasing conflict, the same kind of story we find in many heroic narratives of literature or film. At the peak of difficulty, there's an epic battle. On one side, there's the player, with everything she's learned. On the other side, there's the game's system at its utmost, wielding a climactic scene that the designer of the game has made to "throw the kitchen sink" of possible challenges at the player.

Difficulty can be compelling and dramatic: the player starts off easy, learns and deepens her understanding of the game's possibilities, and climbs through increasing challenges to master the system. Overcoming difficulty is deeply appealing to us as human beings for good reason: it can give us confidence in our own ability to learn and even master difficult aspects of our lives.

In earlier chapters, we looked at how verbs can develop in relation to objects and other verbs. These elements of vocabulary are the building blocks of a conversation that players have with games we create, a conversation that we enable and shape by developing the game's vocabulary. In this chapter, we discuss how ideas about pacing and development can be applied to the entire experience of a game, from the start through the middle and toward the end—assuming the game even has an end!

When we think about games as a conversation, we can discover many potential ways of looking at games. After all, not every conversation needs to be about challenging the participants, even if many important conversations are challenging. In a conversation, challenge can mix with pauses for reflection, times when we listen quietly, and statements of support and reassurance. Conversations are about push and pull: one person says something, and the other person listens and responds. At times we challenge each other, and at other times we allow another's thoughts to explore and develop. A good conversation isn't necessarily led by one person either; some or all the participants have ways to voice their own input about the pace and goals of the conversation.

We can find ways to do all these things with games as well, in the unique ways that conversing through a system can create. As the creators of a game, we can shape the ways that the player can push and pull through the game's system. Verbs are a great example of how a player can take an action and push into a game. We can share decisions with the player about how the push and pull of its conversation evolves—even the purpose of the conversation.

Resistance is another way of thinking about the push and pull of games. When a player uses the verbs at her disposal, she pushes against the game to see what will happen, and the game responds. As discussed in Chapter 3, "Scenes," when the player of Tombed uses the "dig" verb against a metal section of floor, causing Danger Jane to hit it with her shovel, the game
responds with Jane's digging animation and a metallic "ting" sound, but nothing else.
The metal block does not give way but resists the verb. In that single moment of gameplay, the
game has responded to the player's push by pushing back and providing resistance.

In longer stretches of time than a single moment, the player may try many different ways to
push into the system of the game: perhaps using the "dig" verb in different circumstances, or
combining digging with left or right movement to drop Jane further into the vertical column
that comprises the space of Tombed. The player may develop strategies to deal with the differ­
ent scenes that follow in succession, developing her understanding of when and how to use
verbs—including the "un-verb" of simply waiting for the ceiling to descend and destroy metal
objects—so she can keep playing and reach the bottom.

The player of Tombed will also think about the goals presented by the game and her own goals
in playing—the aspects of the game that pull her forward as she pursues them. She'll have to
reconsider how to reach those goals after she finds that Jane gets crushed by the descending
spiked ceiling and falls off the bottom of the screen, followed in turn by the game resetting
itself to an earlier state. This is a different kind of push from the game, declaring that the player
won't be allowed to proceed if the spiked ceiling contacts the top of Jane's hat. The player must
decide how to respond and if she wants to keep pushing. Does the player want to win? Then
she has to find ways to push when the system pushes her back.

At each turn, the player pushes in different and increasingly complex ways, and Tombed pushes
back: always applying pressure with the unstoppable descent of the spiked ceiling, but also
with the changing objects that make up each scene, pushing the player to find new ways to use
verbs and keep descending. Finally, Tombed stops pushing when the player reaches the bottom
of the shaft. The oppressive ceiling disappears, the player uses the "dig" verb one last time, and
the game ends.

Tombed is a straightforward game in many ways. It has a few different verbs and can be played
from beginning to end in under three minutes. Even so, the player must find many different
ways to use those verbs and push to reach the end. Tombed was designed and paced to push
back in different ways as well, sometimes giving the player a longer span of time to consider
her decisions, and sometimes demanding that she act immediately. Sometimes she's allowed
many choices, and sometimes very few.

Flow

Back in Chapter 1, "Language," we made fun of the word "flow." It's a term that's often used by
game designers to talk about difficulty, pacing, and challenge in games, but sometimes "flow"
is tossed around so freely that it becomes a substitute for "fun" or "quality"—as if flow is a magi­
cal substance needed to keep players captivated by your game.
Flow is part of a psychological theory, first proposed by Mihály Csikszentmihályi; it describes a state of focused motivation where someone's so involved and energized by what she's doing that she becomes completely absorbed and caught up in it. This state of flow is similar to colloquial ideas like “being in the zone.” It sounds like a wonderful thing; understandably, many game creators want as much flow as possible in their games. Flow doesn’t just come out of nowhere, though. Much has been written about flow, but most of what’s useful for making games can be summarized in three elements that Csikszentmihályi says are necessary for flow to occur.

The first condition for flow is a situation with goals and a participant who can take action to make progress toward those goals. Luckily for us, both these things are fairly common elements of games. The second condition for flow is feedback: the person experiencing flow has to see what happens as she tries to move toward her goal and be able to adjust her actions to respond to changing demands. If this sounds familiar, it’s because feedback is exactly what we’ve been referring to as resistance. Flow is just one way to talk about what happens when the objects, verbs, and resistance of a game develop at a particular pace that encourages a player to stick around for more of the conversation.

It’s not enough to simply give players feedback in response to their actions. The third element of flow is that demands on the player’s choices and actions must change and evolve over time. At first, figuring out how to use a game’s verbs to jump over a wall might be an interesting goal with feedback. The player figures out when to jump, and the game shows her that she made it over the wall. Now imagine repeating that action. If she had to jump over the same wall in a modded version of Super Mario Bros., at the same interval, for ten minutes on end, it would become tedious. It would turn into a test of patience more than anything else, and it potentially would feel like a waste of time (see Figure 6.1).

![Figure 6.1](image_url)  What if your avatar had to tediously jump over a long series of walls?

The simplicity and lack of evolution in repetitive, already mastered tasks results in boredom, one of the two pitfalls that disrupt flow. On the flip side, flow can also be disrupted if challenges are too difficult before the player has enough understanding and mastery of verbs to overcome them. If the next challenge after jumping over a simple wall involves a highly developed use of the verb that requires a lot of timing, the player may fail over and over again. She may end up feeling like her attempts are futile. This results in frustration and, like boredom, it can feel like a waste of time. The player feels stuck “doing nothing” rather than continuing to move through a flow-inducing series of evolving choices, actions, and challenges.
In terms of resistance, boredom is what happens when a player isn't being pushed by the game system to do anything except repeat an action she already knows how to push with. Frustration can be similarly repetitive, such as a player pushing into the conversation of the game and being told, “No, that’s not it, try again” over and over again. Although resistance is happening, it’s stuck in a loop.

A commonly expressed idea about flow and games is that as designers, we should try to stick carefully to a channel between boredom and frustration, like a shark swimming between dangerous rocks on either side. Also like a shark, the challenge of a game in this model has to keep moving, so that repetition of actions that the player’s starting to master doesn’t get boring. Get the difficulty exactly right, and the player will stick with your game, developing more and more skill. The game then needs to respond in new ways, pushing back by providing the player with ever greater challenges. This upward ascent resembles a slope toward the maximum possible challenge (see Figure 6.2). It’s similar to the narrative of difficulty mentioned earlier, an uphill battle toward an epic conflict. Unlike the simple idea of “the most difficult is the best,” however, thinking in terms of flow lets us focus more on the process of this journey. All along the way, the game must keep evolving the system to provide more difficulty so that the player will stay engaged until she reaches that pinnacle.

Figure 6.2  For some game creators, the ideal experience involves staying in the zone between boredom and frustration as the player’s skills improve.
The channel between boredom and frustration is an ideal path, like a perfect model that many games strive for. In a game with perfect flow, the player would push and be pushed back but would be so engaged in what’s going on that it would all feel seamless, natural. Some games are good at finding this channel—even if they don’t start there at the beginning of a player’s experience!

*Super Hexagon* (2012) by Terry Cavanagh is an interesting example. To play, you simply use the verbs “rotate clockwise” and “rotate counterclockwise” to keep the arrow you control from colliding with a series of walls closing in from the outside of the screen (see Figure 6.3). The player has to rotate the triangle to go through the gaps. At the beginning, this is an incredibly difficult task, and a player is likely to die by colliding with a wall almost immediately, making game sessions last less than ten seconds. At first, this seems like a clear violation of the “perfect model” of flow, but *Super Hexagon* uses a simple enough system that it doesn’t need to start off slow and easy. The player learns what to do by colliding with walls, over and over again. Because these early sessions are so short, it’s easy for the player to jump in again, grasp the patterns of walls that close in on her, and hone her reflexes.

![Figure 6.3](image)

*Figure 6.3  Super Hexagon dares to start off super-challenging.*

Before long, many players will improve—and notice that they’ve improved, since their game sessions (and “longest time” records) will be getting longer. This kind of motivating feedback is essential for flow, but it’s worth noting that *Super Hexagon* doesn’t start off at the bottom-left
corner of a flow diagram—the kind of very easy, no-skill-required experience that often involves a tutorial that holds your hand or practice levels that go easy on you. Instead, it drops the player into the frustration of the game like a skier descending a steep slope (see Figure 6.4) and lets her figure out through short bursts of intense play that once she starts to get the hang of it, the challenge will become manageable. That steep slope may even be part of why getting better at this game feels so exciting. *Super Hexagon* shows us that not all games have to adhere to or strive for one model of flow. Following the “ideal” channel from bottom left to top right is just an idea that’s become traditional for many game creators.

![Flow Diagram](image)

**Figure 6.4** If a player isn’t put off by the difficult beginning, finding the flow of *Super Hexagon* can be a thrilling ride.

Instead of a straight line running from bottom left to top right on the flow diagram, the experience of many games involves a zigzag path. A game will present a new challenge, like a more difficult kind of jump, a new verb like “shoot” that has to be used in a different way (for instance, timing your shots so that they don’t miss), or a combination of verbs, like “jumping” and “shooting “at the same.

The player has to figure out how to master this new challenge. It’s a process that often feels frustrating at first as the player learns how to deal with it, especially if she doesn’t get it right on
the first try. As she masters the new challenge, the push of frustration lessens. Repeating the same action again and again drifts toward boredom, creating a zigzag. Of course, not all players are the same: some might master a verb or combination of verbs quickly, especially if they have experience from other games, while others may spend longer being frustrated. The purple line in Figure 6.5 shows the traditional idea of ideal flow, with a frustrated player following the red line and a player who masters challenges easily following the blue line.

![Flow Diagram](image)

**Figure 6.5** Same flow diagram but with zigzag lines for different players.

In shaping the conversation of their game, game designers have figured out how to make this zigzag pattern part of a story that’s told through play. A moment of intense challenge that requires the player to use the verbs they’ve been practicing in previous sections might involve fighting a boss, for example. The visual and audio cues that accompany this moment might include a larger graphic to represent this dangerous obstacle, with music or sound effects that convey an ominous or climactic feel. Before and after this moment, the context isn’t as intense, and neither is the challenge: the player can relax and prepare for the next big moment, following an arc that builds up to the next conflict (see Figure 6.6). We discuss more ways to create these kinds of pauses and plateaus (where the line of flow becomes more horizontal) throughout this chapter.
**Adjusting Difficulty**

Games like *Super Hexagon* require the player to deal with frustration and failure and commit the time to overcome hard challenges. Competitive multiplayer games have a long legacy of putting this responsibility in the hands of players—in these games, not just a single player but a pair of competitors, or even a group or community of players who play together. Players who enjoy sport-like digital games such as *Hokra* (2011) or *BaraBariBall* (2012) have to teach newcomers how to master the challenges of the game, growing a community of players so they have more opponents to face. The difficulty in these games comes largely from how good your opponent is. Players can take it easy on beginners or play with deliberate limitations (or handicaps) to help them learn.

Single-player games face a different kind of problem because the player is alone in conversation with a system that can only say as much as its designer has allowed it to. Even so, it’s possible for the creators of a game to reveal some of what’s going on in the system and give players control over whether it offers more risk of frustration or boredom.
One common way to provide this control is to have the player select a difficulty mode at the beginning of the game. The player chooses whether she wants an experience that starts off challenging and evolves to become even more difficult, or one that’s easier—potentially to the point of boredom. Creating more than one way to pace the same game system can be difficult, however; one mode often ends up being perceived by players as the “real game.” Often this is the most difficult mode, especially for players who value skill and mastery. In addition, giving players this choice at the beginning of the game, before they understand the kind of resistance that the game offers, asks them to guess which difficulty setting will be most satisfying for them. What if a player is good at one aspect of the game but not others? Some games offer detailed controls for adjusting many aspects of difficulty, but there’s still a paradox: to understand how all those controls will affect a player’s experience, the player first has to learn how to play the game well enough to grasp her options.

In the early decades of digital games, the audience of players was relatively limited. Not only were most self-identified gamers white, male, and well-off enough to have steady access to computer technology (or at least quarters to dump into an arcade machine), but gamer culture and the systems it produced were focused on difficulty, challenge, and mastery. By the turn of the millennium, things had already changed a lot, and the game industry launched a new wave of “casual” games. These games were targeted toward players outside the usual suspects, many of them women, girls, and older people who weren’t part of the earlier eras of game enthusiasm. Casual games were known for being much less punishing and intensely difficult than games of earlier decades, and for bringing a much larger segment of the population to gaming. Gamers who had less experience with and fewer preconceptions about a particular kind of system are even less likely to grasp intuitively whether they want to play the “Hard” or “Easy” setting. Ever since the “casual revolution,” game creators are more likely to ask, “Who is this game for?” and sometimes, “How can we make this game more fun for more people?”

Game developers have been searching for many years for ways to seamlessly mold the resistance of a game to match each player’s abilities rather than create a kind of flow experience that works for some players but frustrates or bores others. Many of these attempts fall under the concept of dynamic difficulty adjustment (DDA): methods of adjusting the rules and resources of a game to help players who are struggling with a game’s resistance, and increasing the challenge for players who are doing very well. When you’re playing the first-person shooter Half-Life 2 (2004), you’ll occasionally come across crates that contain helpful items to replenish your health points or ammunition (see Figure 6.7). If you’re well stocked with these resources, you’ll find fewer items inside a particular crate, but if you’re doing poorly and running low on ammo or health, that same crate is more likely to contain items that will help you replenish those resources. Many players of Half-Life 2 never notice that they just happened to get a more powerful healing item when they were running low on health; designers who use DDA extensively, helping players who struggle while increasing challenge for others, often try to do so subtly.
Figure 6.7  If you’re running low on ammunition in *Half-Life 2*, this crate is likely to contain some to help you out.

Much more egregious examples abound in games. In many racing games, for example, your opponents will actually drive faster if you’re in the lead and slower if you’re trying to catch up to them. It’s not hard to understand how this kind of adjustment keeps the game interesting in the service of flow, but becoming aware of how strangely fluid the behavior of the competition is can be jarring. It might even make the player feel like her own abilities and struggles don’t really matter, because the reality of the game world will be adjusted based on the player’s situation.

Subtlety is necessary in DDA because of how it changes and manipulates the conversation between player and game. When the player pushes against the game and doesn’t manage to make a difference or she meets an expected goal, the game pulls back its own resistance; when the player pushes forward successfully, the game’s resistance increases as well. Learning a game through your own ongoing conversation with it is a process of exploration. Exploring a system with an intense amount of DDA is like having a conversation with someone who’s changing her mind constantly based on what you’re expressing.

Used bluntly, DDA can give the resistance of a game a mushy feeling, as if there’s no fixed structure that the player can meaningfully encounter and push against. Used subtly, DDA may go unnoticed by players, but it’s still quietly manipulating the shape of resistance to create the
smoothest experience of flow, rather than presenting some unmoving challenges to the player and letting her decide how to overcome it—or simply stop playing. It's no wonder that many creators of smaller games in recent years avoid DDA and simply let their game systems function without constant adjustments and modifications. Would Super Hexagon be a better game if Terry Cavanagh had designed it to get easier when the player inevitably fails at its extreme challenge? The shape of that game's relentless resistance to player effort would become different, more malleable—and perhaps less meaningful for players who are willing to throw themselves again and again to build their skills in a hard kind of fun.

DDA doesn't have to leave players' choices about how much resistance they encounter by the wayside. FlOw (2006) was one of the first games designed by Jenova Chen, who chose that name because part of what he and his collaborators were influenced by and seeking to explore was the idea of flow in games. Rather than adjusting the system's resistance purely based on the player's performance, FlOw tries to give the player concrete choices about pacing the game. In FlOw, you control a fish-like creature swimming in an area with other creatures that can be eaten—and that will sometimes try to eat you. If you successfully maneuver your fish's mouth onto one of these creatures, they burst into white food pellets that can be eaten to make your own fish's tail longer and capable of withstanding more bites from other creatures. Each area also has a red food pellet your fish can eat that lets you dive deeper into waters with more dangerous, challenging enemies, and a blue food pellet that takes you in the opposite direction, to safer areas. Every player's journey through the shallows and depths of FlOw is slightly different because players can retreat and advance based on how much challenge they're seeking. Also, losing all your health doesn't result in the game ending; you instead bump up one level to an easier area.

The organic, player-controlled difficulty of FlOw is more integrated into the course of playing the game than asking the player to choose "Hard" or "Easy" before the game starts or via a settings control panel. Structurally, it has similarities to early digital games like NetHack (1987), where the player learns that travelling deeper into a dungeon via a staircase she's discovered will lead to greater challenge. In NetHack, your goal as a player is stated from the beginning: reach level 100 and claim the ultimate prize, the "Amulet of Yendor," before you succumb to various threats and enemies that end the game.

fLOw, like Chen's other games, is much less explicit about the player's purpose and whether she should be trying to dive as deep as possible at all. Although reaching the bottom layer of FlOw does give the player the opportunity to unlock more varieties of fish to play as, it's possible to play and enjoy the game while simply wandering through higher layers and surviving and eating like a simple oceanic organism, content with its lot. Many players, especially those trained to think of games as challenges to overcome, can play FlOw as a game of increasing challenge, much like they might play NetHack, but FlOw avoids stating overtly what a player must do to win.
There’s no single correct way to shape the difficulty of a game into exactly the right kind of resistance for every player. The right decision for your game depends on its goals and what it’s trying to say in a conversation with players: do you want a highly flexible push-and-pull game that changes shape depending on how the player approaches it? Or will you establish a firm structure, making a hard declaration of what your system requires, and let players figure out how to handle it—even if it means some of them may leave the game before finishing it or miss the perfect flow by a wide margin? Do you intend to involve players in deciding how the game’s resistance evolves? If games are conversations, they’re ones where, as designers, we have to choose what we say carefully and know what we’re going to say in advance, even though we’re often unable to anticipate how all the unique players will react. When we create spaces for players to make their own choices and determine their own approaches to a system, all sorts of things can happen—but that may mean that our own ideas of how the conversation will unfold have to play less of a role as well.

Alternatives to Flow

So far, our discussion of flow has revolved around the idea that games ought to try to adapt to players, avoiding frustration or boredom for too long, and sometimes including players in decisions about how the games’ resistance evolves. Seeking flow states means “meeting players where they are” and ceding some degree of authorial control to foster feelings of engagement and, gradually, mastery through skill building.

Striving for a game with ideal flow that always moves perfectly between frustration and boredom isn’t the only way to make a game, however. It’s possible to create interesting games that don’t seek out a perfect flow state. For example, what would happen if a game didn’t start out slow and easy and didn’t get harder?

*Three Body Problem* (2012) by Robin Burkinshaw doesn’t change at all as the player continues to interact with it (see Figure 6.8). The system starts off as hard as it’s ever going to get, but with simple rules: the player has to maneuver a square to collect points that appear, while two other squares try to collide with and kill it. Just as with *Super Hexagon*, the first time you play *Three Body Problem* you’re likely to die very quickly, because the other squares are relentlessly chasing you. It’s not an impossibly frustrating problem, however; you can quickly learn to survive longer by watching and learning how the other two squares move.

With practice, a player of *Three Body Problem* can close the gap between her abilities and the challenge, making the game easier. This model puts all the responsibility for creating flow into the player’s hands: she has to accept that she’s a long way from mastery and keep working at it of her own accord. Once she can handle the challenge, the task becomes to survive as long as possible to collect more points, challenging both endurance and skill. If we made a diagram of a player’s experience of flow in this game, it would look very different for each player depending
on how each dealt with the challenge of the game’s simple system. Rather than trying to meet players where they are, it’s up to an individual to decide where to meet *Three Body Problem*.

![Three Body Problem](image)

Figure 6.8 *Three Body Problem* is always just as difficult as when it began.

Games like this demand more from a player than games that hold the player’s hand, but for players who are willing to start in a frustrated place and learn their way out of it, powerful feelings of flow can still emerge.

There’s another reason to consider alternatives to traditional flow and require players to meet the game, rather than the other way around: although it’s often strategic in a conversation to try to adapt how you speak to your listeners, sometimes that’s not enough. Sometimes you have to ask the other participants to hear exactly what you’re saying—and as we discussed in the previous chapter, some games are more about asking players to listen. *Gone Home* (2013) is a game in which players enter a house seemingly abandoned by its family, taking on the role of the eldest daughter who’s returned from abroad. At first, *Gone Home* seems to play with some conventions of horror games—you explore dark rooms, looking for secrets, and are startled by creepy noises (see Figure 6.9).

The revelation of *Gone Home* is that it’s not a game about facing undead horrors or even about a mounting arc of difficulty and mastery. Instead, you find clues as to the recent and long-buried history of the house of the protagonist’s family, uncovering the truth about why nobody’s home through diary entries, letters, bills, notes hastily left on the kitchen table, and
the mundane details of household life. There’s challenge and problem-solving in Gone Home as you piece together clues and search for secret passages, but it’s not an experience that needs to grow more challenging or gradually build the player’s skills. Instead, the player comes to understand the systems at play—the relationships of characters, the ways that different members of the family inhabit and use various parts of the house—by uncovering new information, some of it in the form of words or diagrams, some of it ingrained in the spatial arrangement and visual representation of a home.

Figure 6.9 Gone Home subverts expectations with unnerving experiences that can’t be conquered with typical game verbs.

Gone Home is set in a world that closely mirrors our own—it could be drawn from the experiences of real people. Of course, some games are overtly autobiographical, like dys4ia, which we’ve already discussed, or Mainichi (2012) by Mattie Brice, a game that represents a single day within the author’s life. It doesn’t necessarily make sense to create a traditional journey of flow through a game that recounts actual events—after all, real people’s lives don’t always progress from easier to more challenging. They can’t necessarily be conquered by building skills and systemic understanding, but they can be represented through systems. The shape of resistance in these games plays a role—showing players where the systems represented can or can’t be pushed—but the experiences that result aren’t necessarily about players overcoming resistance or finding strategies to plant their own flag of victory at the top of a mountain. Instead, they offer players an opportunity to listen and understand systems that they might not otherwise have considered.
Design Intuitively

by Rob Daviau

If there's one person I know whose livelihood depends on people understanding his games right out of the box, it's Hasbro designer Rob Daviau. It is not uncommon for him to be presented with two simple beats ("It's Pixar's 'Cars' meets Operation!"), and know that he has very little room for error in making his games intuitive. The cool thing about Rob is that when he tackles a more complex subject, such as Risk: Black Ops or Heroscape, you can see that intuitiveness beam through just as clearly.

A few years back I was at MIT (1) and I had a room of about 25 ridiculously smart people at my disposal. So, like anyone, I tried a sadistic experiment. "Pair up," I said, "and choose a game that looks fun but you know nothing about." Eagerly they picked their games and returned to their seats, ready to open them and see what was in there.

"So the challenge is simple," I continued. "You and your teammate have five minutes to learn this game and present it to the rest of us.

"Oh, I've also removed all the rulebooks."

Take that, smart people.

But against every expectation I had, they did an amazing job. Now, granted, they spend most of their time inventing molecules or building cold fusion coffee makers, so they probably have a leg up on a lot of people. But the fact remains that people who'd never seen these games before could still intuit how to play them given nothing more than the bits, the box, and five minutes (2).

This episode changed my entire outlook on game rules. I had, as you will, an epiphany!
Rules shouldn't explain a game; they should only confirm what the rest of the game tells you.

That is, if your game makes intuitive sense from the moment players crack open the box, then you've done far more work toward people learning the game than you think.

Because tabletop games, unlike videogames, require every player to understand the entire game system to play. You need to understand not only the components, the goal, the rules, and the flow of play, but also how to assemble all these into a comprehensive strategy that will lead you to victory (3).

We've all played games that make no sense at all, where every rule fights another and the pieces seem like an afterthought. Don't design one of those. Instead, design games that need the rulebook as little as possible.

If you are using the rulebook to fix an unintuitive game, you are making it very hard on your players to enjoy what you designed.

**What, exactly, is a game?**

A while back I came up with my definition of what a game is, which is sort of a milestone for game designers (4). We're going to use this definition to walk through different areas to focus on for intuitive design:

A game is an interactive mathematical system, made concrete, used to tell a story.

Just to clarify a bit:

- "Interactive mathematical system" = mechanics and rules
- "made concrete" = pieces and graphics
- "story" = theme

Although all games have these three elements, the weighting of them varies...
greatly from game to game. Roleplaying games, for example, consist almost entirely of story with enough of a mathematical system to make the story work (6); they can often play without pieces or graphics. Eurogames, on the other hand, are heavy on math systems, while the story is extraneous and the pieces are often reused from game to game. Abstract games ignore story entirely (6). Miniatures games are all about the pieces. And so on. There is no magic weighting to these components. If you want to design a Eurogame, just know that your mathematical system is going to have a lot of weight, so pay particular attention to making that intuitive. Your audience will not mind a light theme or generic cubes and meeples. If you are designing a wargame, you’re going to want elements more evenly weighted.

Let’s take a look at how to make each component of this definition intuitive, so that players will enjoy your work without a struggle.

**The joys of an intuitive interactive math system**

This is the nuts and bolts. The mechanics. The good stuff.

Every single game can be broken down into one ugly flowchart that defines everything players need to know about the order of play. I don’t know anyone who actually makes this flowchart, even when designing, but I’ll make an exception this time. Here is the flowchart to *Jenga* (1).
Pull out a block and put it on top of the tower.

Did the tower fall over?

Yes

You lose.

No

Even if you don't flowchart your design, it still helps to think about it, so you can see exactly what it is you intend your players to learn and understand. If your flowchart has a whole side branch sprawling out to explain/control/balance one little part, then re-think that part. The more intuitive the mental flowchart, the easier your game will be to learn and the better it will be to play. The rules are usually the flowchart cleverly disguised as words, so you will know, once you get to rules, how intuitive your design is. If you can't explain something easily or you can't figure out what to explain first, you might want to go back and change the mechanics rather than spend time making the rules clearer. Rules are a poor patch for chunky design.

If you are reading this book (.), then probably you already can learn a game.
better than 99% of the people off the street. You read new rules and unconsciously figure out how this particular game fits your preconception of what a game is based on hundreds of other games you've played in the past. But you're not designing games for you. You're designing for the other 99%.

So make your design as "clean" as possible, meaning all the mechanics are related and necessary. If your game requires players to roll a pool of dice and look for matches, then don't introduce a special case where players must roll one die and look for a number lower than four (4). Likewise, don't make play go counter-clockwise simply because you are bored of clockwise. Keep it simple and sensible: An elegant, easy-to-understand concept or mechanic that accomplishes 95% of what you want is much better than a clunky, obtuse mechanic that gets you 100%.

Similarly, if you have mechanics in there that come up extremely infrequently, try hard to close the loophole so you don't need the "patch." When I was finishing up work on *The Buffy the Vampire Slayer Game* in 2000 (most of the design is someone else's and I don't want to take credit for his brilliant work), we ran into the issue of Oz, who is sometimes human and sometimes a werewolf, possibly getting sired by a vampire. We had a full page of rules regarding werewolf vampires. The rules worked, had nice examples, and would be relevant so infrequently as to be useless. The entire page was changed to "Due to his werewolf blood, Oz cannot be sired." Is it more "realistic"? Probably not. More fun? Probably not, because werewolf vampires sound cool. Is it much easier to learn and play and teach new people? Yes, a thousand times yes (in). Don't fall in love with a fringe element to your game.

Of course, no design starts clean and elegant and intuitive; what's important is that it ends up there. Some designers (like me) are sculptors. We cram everything we possibly can into our early game designs, and then, through testing, pare away everything that doesn't work. Other designers are more like painters, starting with a blank page and adding one mechanic at a time until they complete their design.
But keep in mind that even an elegant, intuitive system can be explained poorly, if you're not careful. For example, *Tigris & Euphrates's* scoring system always gives new players pause. During the game, you earn four different colored cubes; your final score is your number of cubes in the color you have the least of. If you've never played *T&E*, then you probably stopped and reread that sentence; it certainly seems counterintuitive to focus on your weakest color for scoring. But if we change the wording to be "your final score equals the number of complete color sets you have," then suddenly, scoring makes a lot more sense. New players find it more obvious to group four colors into one set and think "that's one point," even though the scoring is exactly the same.

While playtesting your games, you will immediately notice which mechanics people forget or stumble over. If you find yourself constantly needing to remind players to roll a certain die at the end of their turns, for example, then you might want to find a different way to achieve the same effect in your design.

*Making it concrete: graphics and pieces*

Mechanics may be the wizard behind the curtain, but no one plays a flowchart. The flowchart is ever-present—an invisible, abstract set of what-nows and if-then statements floating in the players' minds. But the math must be transformed into something the players can see and touch and move: pieces, cards, dice. These parts dress up your math and make it real.

It's easy to overlook the physical chits and graphics, but you should put as much thought into these as you do the mechanics. The way a game looks and feels informs how the game will play, and serves as an unconscious reminder of the rules. Remember: the first thing players do when they open a new game is not pore over 50 pages of rules. No, the first thing they do is remove all the bits and pieces from the box, enjoying, even savoring, that magic moment of unknown about what they're going to play.
Physical pieces offer all sorts of opportunities to make your design as intuitive as possible:

- **Color**: If a player sees certain colors again and again, he will assume they go together in some way. If you give him four colors, and he knows it's a four-player game, then rightly or wrongly, he'll assume that each player takes pieces of that color. If this is not the case, you'll want to use another distinguishing characteristic—like shape—instead of color. And if your game uses colors in two different ways, then use two different color systems. *Alhambra* makes the mistake of using the same colors two different ways. It's something players have to unlearn and gets in the way of just playing. Also, while we're at it: white means good and black means bad. If you have gold as money use yellow, and if you have wounds use red.

- **Form**: If it looks like a gun, it should shoot. If it looks like a boat, it should go on water. These are overly obvious examples, but consider how each of your pieces should look to best convey their function. If your boat moves three spaces, give it three oars. If it can attack twice, put two cannons on it. If it has a capacity of five cargo cubes, make sure five cargo cubes fit on it or it has a 5 printed on it.

- **Size**: Bigger means "more," "stronger," "elite," or "better." Small means the opposite.

- **Integration**: All the game pieces should work as a whole. If color plays a significant role in the game, then make sure the dice and card backs reflect the game's color scheme. Likewise, if your game includes round tokens, and your board has round spots on it, then players will naturally try to put the tokens on the spots.

- **Game board**: If your game has a board, look at it from many angles, not just right-side up. Does it still make sense when viewed upside down (as players sitting across the table will see it)? Likewise, we've all been trained that certain places on the board correspond to certain gameplay elements; e.g., a numerical
track circumscribing the board means "scoring track." So if certain areas on the board relate to specific pieces or rules, mark them clearly, preferably with a ghosted (i.e., faded) symbol. And don't get complex with your symbols. If you're going to use one, make sure it still makes sense when faded on the board. And viewed upside-down. In low lighting.

- **Reference:** Don't clutter your board with useless information, but do make sure you use your real estate to provide reminders of key rule moments. If there's a space on the board that says "bank," and on the bank space is a "-3 coins" icon, then it's pretty intuitive what happens on that space. And while reference cards may seem redundant to you, to a new player they can be a godsend. Don't be ashamed to throw in reminders and reference cards.

The best way to test the physicality of your prototype is to do what I did at MIT: lay out the game without the rules and have someone try to figure out how to play. Listen in. Ask questions. Have your tester tell you what she has assumed about the gameplay. Chances are, she won't be able to figure it out entirely, but if you listen to the assumptions she makes, you'll learn much about what is (and is not) intuitive in your game.

**Tell a story**

Obviously story matters more to some games than others, but only designers of the most abstract games will ignore theme entirely. If you design Eurogames, theme often comes later—but still take the time to find one that makes the game instinctive.

A game's name and theme set the stage for the play more than you might think. And players can often experience mental whiplash on games that set certain expectations, only to veer in a different direction. The name *Galaxy Trucker* suggests that players will drive an interstellar truck, probably laden with cargo. Guess what? That's mostly what you do. *Race for the Galaxy*, on the other hand,
suggests a racing game, or at least a contest to be the first to achieve something in the galaxy. In this case, not so much; the game is really about civilization building, which is a race. Sort of. Immediately, players have to unlearn their misconceptions before they can learn the game. It's still a very good game.

So if you call your game “Pirate Adventures: Mutiny on the High Seas,” but it's actually a Eurogame about cargo loading and worker allocation, I'm taking a lot of time trying to figure out where my cannons and gold and plunder and buried treasure should be. But if you call it “Dockworkers and Cargo,” I understand what I'm getting into. It's not nearly as exciting a name but, intuitively, I get it. Great names should definitely be thematic and inspiring, yet capture exactly what the game is going to be about.

At the same time, be careful not to get so carried away with the theme that it creates obstacles for players learning the game. We all understand the concept of turns and rounds, or victory points and phases. So stick with the common terminology unless new words and phrases would make your game substantially easier to understand.

For example, if a scoring event occurs in your game at the end of four rounds, then you can write, “After four rounds, there is a scoring event to gain VPs.” Predictable, but we all get it.

If your theme could bear “Four seasons make up a year, and there is a scoring event at the end of each year,” then even better. It makes logical sense, and people instinctively expect something to occur after each winter passes.

But writing a rule like “There are four convocations, and after that there will be reckoning to gain Prestige points” is flirting, heavily, with confusion. Maybe it adds thematic drama, but explaining it requires so much unclear terminology that you'll only end up getting in the way of, you know, playing the game.

What the hell does all this mean?
Designing games is not just about crafting rules that makes sense. It's about crafting an experience that makes so much sense that players become utterly immersed in the play.

Most people believe rules are the only thing standing between a designer's vision and the players' enjoyment. But the mechanics, the pieces, and the theme all work together to set the stage and emphasize what the player needs to absorb. Make all these components logical and cohesive—and intuitive—and you'll create a game that transcends the math and cardboard; a game where players aren't just cranking through a set of rules, but enjoying an experience, and telling a story. That game will have a life of its own, even before that rulebook is cracked open.

The views expressed are those of the author and do not necessarily represent the views of Hasbro, Inc.

Rob Daviau started in the game industry by writing an article for Dragon magazine in 1998. This turned into a design job at Hasbro, where he has worked on all sorts of games for all ages. During this time he also designed or co-designed Risk 2210 A.D., Axis & Allies: Pacific, Risk Star Wars, Heroscape, and Risk Legacy.

Endnotes

1. Many good stories start out with this phrase. Other good ways to start a story include "I was in a bar in Amsterdam," "It was about this time that the motorcycle lost control," "I don't remember actually getting the tattoo," and "An old man in robes sits down with your party and says I'm looking for some adventurers." (1)

2. You should try this sometime with a new game. Makes you see new games in a new way. (2)
3. And they should be fun, too. This may seem obvious, but I swear I've played some games that have missed this vital point and come across like graphics vomited onto a math problem. (4)

4. As is clinging to some design that you just love but everyone knows is awful. (4)

5. Honestly, you can ignore at least half the rules of any RPG system. RPGs don't have rules; they have guidelines. And 10 foot poles. (5)

6. Have you ever really felt like you're on a medieval battlefield while playing chess? Has it even crossed your mind? (6)

7. I used to use Candy Land as an example of an easy flowchart only to discover that it isn't. It's not hard, mind you, but I looked like an idiot at a whiteboard getting the flowchart to Candy Land messed up. (7)

8. As if there were any other possibility. (8)

9. In fact, high should be good, and low should be bad, unless you really can't do it any other way. Yes, I would say—and have said—this to Larry Harris about Axis & Allies. (9)

10. Eight years later, I did the same thing to Clue. There used to be a whole block of rules about blocking people in a room, something that would be hard to do if you tried, let alone by accident. By changing the design to allow movement through other characters, I removed about two paragraphs of rules that shouldn't have been there in the first place. (10)

11. For example, one to track player identification, and another to track resources. (11)

12. "Dockworkers and Cargo" is actually an awful, awful name and would never, ever be bought by anyone who wants to have a fun time. But this is an article about design intuition, not naming games that sell. (12)

13. Although surprisingly, those two words are used interchangeably in different
games. Can we create a convention right now? A player takes a turn. All the players taking one turn is a round. Who do I talk to about codifying this?
Writing Precise Rules

by Mike Selinker

I’ve redesigned, expanded, adapted, and creative-directed a lot of very big games: Axis & Allies, Dungeons & Dragons, Attack!, Risk, and the like. Their rule sets are often similarly gigantic, which means they need special attention paid to clarity and purpose. Otherwise, I might get a game whose FAQ is longer than other games’ entire rulebooks. Here, I’ll go into what makes a rule set good, and what makes one not so good.

I play games for a living. Writing rules is what I do for fun. Of all the things I like about being a game designer, the ability to craft something elegant is the one I enjoy most, because it’s a difficult thing to do well.

I have a few rules writing maxims that I’ve never put in one place. They’re about what you write when your game has made it out of the development phase and now needs to be played by people who aren’t you. If you’d like to try them out, have a go.

I’ll also introduce each of the ten maxims with a game rule that deserved some extra attention, but didn’t get it.

Use no intermediary terminology

A hexagonal grid has been printed on the board to determine movement. Hereafter, these hexagons will be called “squares.”

—Afrika Korps

I just made my geometry teacher roll over in his irregular hexahedron. Hexagons can be called many things—hexes, spaces, zones—but they cannot, under any circumstances, be called squares.

Call the thing what it is, and people will remember it just by looking at it. Those things in your dice bag are named by their number of faces: this is a 12-sider (or

d12), that is a 20-sider (or d20). The first designers to use polyhedrals didn't call one the "breaker" and one the "thunderstriker." Placing intermediary names for things in the way of comprehension only obscures comprehension.

My design partner James Ernest and I were required by our publisher to convert a board game written in English to an internationally usable form. So the cards for *Gloria Mundi* were renamed into Latin, a language that everyone fails to speak equally. I went through and picked Latin names you could associate with English terms; for example, the Fish Market became the Piscatorium. But a much harder task was taking phrases such as "At the end of your turn, you may discard one Building card on the table (including the Marketplace) and replace it with the Shock Troops!" and turning them into symbols. Eventually we cut all the complex cards to avoid requiring too much symbolic translation. The game got worse because of it, and now we're playing the game in English again (1).

Properly used, symbols can be fine, but one symbol cannot do the work of ten. The excellent game *Bang!* took a cheater's way out that I would not advise. It put on many cards a little book symbol that just meant "See the rulebook." Yuck.

**Use real words**

2.24 in GUN DUELS: Vs a non-concealed, non-Aerial DEFENDER's declared Defensive First Fire attack on it, a vehicle may attempt in Bounding First Fire (D\[9\]) its MA (\text{\textit{max}}) (including Passenger FP/SW) at that DEFENDER first, provided the vehicle need not change CA, is not conducting DVer (D\[2\]), its total Gun Duel DRM (\text{i.e., its total Fire-based \([5.5]\) and Acquisition \([6.5]\) TH DRM for its potential shot) is < that of the DEFENDER, and the DEFENDER's attack is not Reaction Fire (D\[7\]). Neither the +1 DRM for a Gyrastabilizer nor the doubling of the lower DR for other ordnance in TH Case C4 (5.35) is included in the Gun Duel DRM calculation. The order of fire for non-ordnance/SW is determined as if it were ordnance [EXC TH Case A can apply only if the unit/weapon is mounted-on/aboard a vehicle that is changing CA; all such non-mortar-mouted fire is considered NT for purposes of TH Case C, and A.5 applies to any type of FG]. If the ATTACKER's and DEFENDER's total Gun Duel DRM are equal, the lower Final TH (or non-ordnance IFT) DR fires first—and voids the opponent's return shot by eliminating, breaking, stunning, or shocking it. If those two Final DR are equal, both shots are resolved simultaneously.

Any EA change the DEFENDER requires in order to shoot (5.11) is made before the ATTACKER's
If you’re selling a game to English-speaking customers, there’s no excuse for writing it in anything but English. Advanced Squad Leader is one of the greatest games of all time, but only if you have a Rosetta stone for the damn thing. Since it’s my favorite wargame, I understand how to play it, and I also understand I would never let a new player try to learn from the rules.

The rule above isn’t a bad rule. It’s actually a pretty good rule. It says, translated, that when a vehicle is attacked, it gets to return fire beforehand, but under some more limited circumstances and without all the bells and whistles. But the rule writers forgot that most people don’t read rule books in order, and so they might not know what “attempt to Bounding First Fire (D3,3) its MA (/other-PP, including Passenger FP/SW)” means. They also believed that a phrase such as “Bounding First Fire” makes a good verb.

Once you have a real word for something, don’t use any other word for it.

Uber-designer Jonathan Tweet has a maxim of his own: “Things are the same, or they are different.” If you have called your attack a “salvo,” it must always be a “salvo,” and never an “attack.” If that bothers you, maybe you should have just called it an “attack.”

Make no more work than necessary

Fate (the gamemaster) then makes a percentile die roll to determine whether the empty ship will be safe or not. The first roll is a 33. This indicates there is only a 33% chance of the boat remaining safe. Fate then rolls again. The resulting roll of 40 indicates that their ship won’t be there upon return. How and when the ship is lost is up to Fate.

—The World of Symibarr

Yes, I know this is a board and card game design book, and I just quoted an RPG—and not just any RPG, but what some people believe is the worst RPG
product ever. (It isn't. But it's close.) The *Synnibarr* rule commits a cardinal sin that bears noting for card games and board games, too. It requires the person administering the game to do more work than she needs to.

Let's say you're "Fate." (Cringe.) You need to know whether the ship is safe. The rules tell you to roll dice to establish the percentage chance of the ship being safe. Then the rules tell you to roll again, and if you roll equal to or under that percentage, the ship is lost. What is the chance the ship is safe? Your first roll will be between 1 and 100. Your second roll will be the same thing. So adding up the 1% chance you'll roll equal to or under a 1, and the 2% chance you'll roll equal to or under a 2, and so on up to the 100% you'll roll equal to or under a 100, then divide by 100... and you get 50.5%. In other words, it's a coin flip. So just tell the GM—I'm sorry, Fate—that there's a 50% chance the ship is gone, and she'll have to roll only once.

It's not just bad games that have this problem. When I helped reboot *Axis & Allies*, I looked at every rule to see how much effort the player was required to expend. In the 1986 version, there were two combat sequences: land combat and naval combat. That was just too burdensome. After weeks of rewriting and testing, we got it down to one sequence that included everything from anti-aircraft guns blasting Stukas out of the London sky, to submarines sinking merchant fleets off the coast of Japan. (See "Axis & Allies Terms").

### Axis & Allies Terms

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<td>an action</td>
<td>a phase</td>
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<td>a battle</td>
<td>a combat</td>
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<tr>
<td>land (or naval) combat sequence</td>
<td>combat sequence</td>
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<tr>
<td>combat sphere action</td>
<td>combat action</td>
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<tr>
<td>naval combat</td>
<td>sea combat</td>
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<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>attack capability or attack factor</td>
<td>attack</td>
</tr>
<tr>
<td>defense capability or defense factor</td>
<td>defense</td>
</tr>
<tr>
<td>counterattack</td>
<td>defend</td>
</tr>
<tr>
<td>enemy-controlled or enemy-occupied</td>
<td>hostile</td>
</tr>
<tr>
<td>allied</td>
<td>friendly</td>
</tr>
<tr>
<td>naval unit</td>
<td>sea unit</td>
</tr>
<tr>
<td>an infantry unit</td>
<td>an infantry</td>
</tr>
<tr>
<td>an artillery unit</td>
<td>an artillery</td>
</tr>
<tr>
<td>an armor unit</td>
<td>a tank</td>
</tr>
<tr>
<td>armor</td>
<td>tanks</td>
</tr>
<tr>
<td>plane</td>
<td>air unit</td>
</tr>
<tr>
<td>fighter plane</td>
<td>fighter</td>
</tr>
<tr>
<td>round of combat</td>
<td>cycle</td>
</tr>
<tr>
<td>first shot attack</td>
<td>sneak attack</td>
</tr>
<tr>
<td>support attack</td>
<td>bombardment</td>
</tr>
<tr>
<td>make a support attack</td>
<td>bombard</td>
</tr>
<tr>
<td>National Control Marker (NCM)</td>
<td>control marker</td>
</tr>
<tr>
<td>casualty line</td>
<td>casualty zone</td>
</tr>
<tr>
<td>I.P.C.</td>
<td>IPC</td>
</tr>
<tr>
<td>penalty</td>
<td>IPC loss</td>
</tr>
</tbody>
</table>
Look, administering rules is work. When a player is learning a game, she wants the simplest possible set of actions to figure out how to play. Cut out all the rules that require her to learn more.

**Add flavor (but not too much flavor)**

NATO has rules covering the use of biological and chemical weapons. To simulate the use of strategic nuclear weapons simply soak the map with lighter fluid and apply a flame.

—NATO: Operational Combat in Europe in the 1970's

Jim Dunnigan felt comfortable writing that rule in 1973. I might not be able to get away with it now. That’s something that looks like rules text, meaning a player might actually do it. (I know; only if they’re dumb. Some players are dumb.)

Flavor text is usually kept outside the rules, often by italicizing it or boxing it or putting it into word balloons issuing from the mouths of cartoon characters. It’s
generally short and pithy, and often funny. In trading card games, it's usually found in italics below the card rules. For example, in the cyberpunk TCG Netrunner, there was a program card called Sphinx 2.0. I wrote, “What runs on four megas in the morning, two megas in the afternoon, and three megas in the evening?" When I stopped typing that, I knew that all work on that card's flavor text had ceased. I didn't need any more flavor than that, and the rest of the card could be ceded to the all-important rules.

Things get tricky when your flavor commingles with your rules. I once had an editor tell me that flavor and rules were like oil and water; they shouldn't be mixed. That editor was wrong. They're more like a Reese's Peanut Butter Cup; you can put them together, but you'd better know what you're doing first. For example, the game Hatfields & McCoys—a true-to-life simulation of Ozark bumbling infighting—is written entirely in the following style:

If'n one o' the other player's Ellies is in the river, all yer Beaus within four spaces gotta move on over to her space and stick with her. Any Beaus who gets to her has to fight while the rest of the Beaus simply just stands there a gawkin'.

That's completely comprehensible, once you get yourself a 'hankerin'—I mean, once you get into the right mindset. But you have to be there. It wouldn't be a good style for simulating the Battle of Thermopylae.

**Make your text no smarter than your reader**

The battlefield is usually produced by placing separate terrain features on a flat board or cloth representing flat good going such as pasture, open arable fields, steppe grassland or smooth desert. Alternatively, the player can provide permanent terrain boards or blocks incorporating equivalent features. The battlefield is now notionally bisected twice at right angles to its edge to produce a equal quarters.

—De Bellis Antiquitatis
"Notionally bisected twice at right angles to its edge to produce 4 equal quarters"? Did D&DA's authors believe that if they'd said "cut into fourths," people would cut it into four triangles? The added specificity makes the game read like James's game *Pontifuse*, whose rules section begins:

To Begin: Create a playing field as follows: From any point in the upper left-hand (northwest) quadrant of a sheet of paper, proceed one inch east and create a three-inch line bearing due south three inches. Duplicate this line one inch farther east. These are the "Lines of Versailles." Then, from the terminus of the second Line of Versailles, proceed 1.14 inches northeast and create a three-inch line bearing due west. Duplicate this line one inch farther north. These are the "Lines of the Commonwealth."

But you see, the thing is that James is kidding, because *Pontifuse* is an "alternate rules set" for the game tic-tac-toe.

There are books that tell you what words are at what reading levels. The Flesch-Kincaid Grade Level Formula is as complicated as the NFL quarterback rating, but if you learn it, you can apply it to your own text. The formula is:

\[
\text{grade level} = \frac{0.39 \times \text{words/sentences}}{\text{syllables/words}} - \frac{15.59}{1}
\]

That'll tell you the grade level of the text you're writing. For example, that *De Bellis Antiquitatis* paragraph has a grade level of 13.22, meaning you'd need to be at least a sophomore to college to have a chance of understanding it.

You don't need a reading score test to know that obfuscation for obfuscation's sake is a bad idea. Write what people can read, and they might even play your game.

**Discard rules that can't be written**

Destroy two target nonblack creatures unless either one is a color the other isn't.

—Magic: The Gathering
That’s the rules text from the Magic card Dead Ringers. It’s about the only way it could have been written given the constraints of Magic’s rules. Here’s why: Cards in Magic have one or more colors (white, blue, black, red, green). The key bit in there is “one or more.” So Dracoplasm is a blue and red creature, and Horned Kavu is a green and red creature. Are they both red cards? Sure. But they’re not both blue cards, and so when both are present, they’re invulnerable to an effect like the one Dead Ringers has, because Dracoplasm is blue and Horned Kavu isn’t. Of course, if either of them is black...

At this point, you’re probably asking whether the developers of that Magic set ever thought, “Seriously, this is gonna make peoples’ heads hurt.” They did. One response to that might have been to throw out the card entirely. They didn’t take that opportunity. And now James keeps a copy of Dead Ringers in his wallet to whip out at cocktail parties.

The rules you select should be chosen not on the basis of whether you like how they play, but whether you can explain how they play. If you can’t, find some other way to play.

Take a breath

Three important rules about industrial complexes have already been stated: (1) newly purchased units you bought at the beginning of your turn in Action can be played only in territories with industrial complexes that you have owned since the beginning of your turn; (2) newly purchased industrial complexes can be placed only in territories that you have owned since the beginning of your turn; and (3) original industrial complexes (those that you started the game with) have unlimited production—that is, you can place any number of newly purchased units on a territory with an original complex, and that new industrial complexes (those that you purchased and placed in any captured during the game) have limited production per turn—that is, the number of newly purchased items that can be placed in a territory with a new complex is EQUAL to the mean value of that territory.

That’s one sentence. A&A designer Larry Harris is a genius, but that’s not something I’d ever like to read again. While doing the reboot, I read that sentence over and over, and then decided that our new version of it would be fewer than 147 words.

When you write your rules, keep in mind how much your reader can read in one swoop. There’s a reason why the sections of this essay are so short. I’ve trained myself to break up major passages into smaller sections.

It’s not just comprehension that’s at stake. Players often need to find a rule in a hurry, and giant blocks of text impede their ability to do so. Subheads, illustrations, occasional use of boldface, and well-timed page breaks will keep your readers on track.

**Go easy on the eyes**

Some Treasure cards also have a NOTORIETY value and a FAME value or FAME price. The six cards labeled “P1” to “P6” in red are TREASURES WITHIN TREASURES cards (or “T-W-T” cards) that contain other treasures. The CHEST (P1) is an item, but the REMAINS OF THIEF and MOULDY SKELETON are exchanged for items, while TOADSTOOL CIRCLE, CRYPT OF THE KNIGHT and ENCHANTED MEADOW are “Site cards” — places where treasures are located.

—Magic Realm

At some point, *Magic Realm*’s designers decided to put all the items and locations in all-caps. And all the spell effects. And all the values. And all the actions. And all the encounter headings. And just about everything else. And so they made the rulebook as irritating as a paragraph that begins most of its sentences with “And.”

Reading is harder than you think. Your eyes don’t stay still, they dart about, catching little bits here and there until, in a split second, you command them to focus. Having all these emphasized phrases is like trying to watch six TVs at once. You lose any sense of meaning when everything in the paragraph is designated as THE MOST IMPORTANT THING. If it would annoy you in an email, don’t do it in
your rules.

It's not just all-caps. In games I revise, I take a hard look at any term whose first letter is capitalized. For the game Balance of Power, I lowercased just about everything the designer uppercased. The term "Bonus Action" doesn't need its capitalization, if you're taking a "bonus action," you know what it is without the extra emphasis. But I did keep the capitalization on the names of the pieces: Noble, King, and General. That's because it did matter to me whether you understood the term "General action" was not the same thing as a "general action"—that is, any old action at all.

Get your final version playtested

During Step 2 of your turn, you may perform these actions in order to manage your holdings: These actions are: build, sprawl, remodel, reorganize, and gamble. You may perform any of these actions in any order, and all of the actions other than gamble may be performed multiple times.

—Lords of Vegas

When James finished the final design draft of the rules for Lords of Vegas, we thought we had a tight set of rules. Then they went to editing, and after a lot of back and forth with Mayfair, we settled on a ready-to-print version. We somehow missed the problem with the above rules paragraph, though. It's fairly subtle, but it's also fairly disastrous.

The rules say, "you may perform these actions in order to manage your casinos." The phrase "in order to" means "so that you may"—at least that's what the people preparing the rules all thought. But "in order" also means "in the following sequence," and so after the game was released we heard from players who first built, then sprawled, then remodeled, then reorganized, then gambled. If you miss that third sentence, you're going to play the game very differently than we intended.

When you're done, get your game in the hands of a great editor. Ask Miranda
Homer to help. Ask Michelle Nephew. Or Gwendolyn Kestrel, or Kim Mohan, or Sue Cook, or Darla Kennerud, or Tanis O'Connor, or any one of a dozen more brilliant game editors I can recommend (2). They'll help you avoid a dawizard (3) that will haunt you forever. If you ever want to win an award for best rules, remember that editors like chocolate.

Also, note that the header doesn't say "Playtest your final version." By "get it playtested," I mean you should get someone who has never seen your game to play it straight from the rules. If they screw it up, you don't have a final version anymore.

The most pathetic cry for help you'll ever see is the word "final" in the filename of a rules draft. This means two things: first, it isn't, and second, the designer knows it isn't but really doesn't want you to notice. Sorry, designer. It's final when it's in the box:

**Fix it in the FAQ**

Q: Why is the Underground Lake on the upper floor?

A: Scc, it's a special kind of levitating lake, and... All right, it's a misprint.

—FAQ for *Betrayal at House on the Hill*

Hey, if a game with my name listed as lead developer has a colossal proofreading error like this, you can forgive yourself a typo or two. Just clean it up online and in the reprint, and try not to make a habit of it. Otherwise, on this book's next printing, your game might make this list.

**Endnotes**

1. See also the great game *Race for the Galaxy*, where my friend Wei-Hwa Huang laid out the cards in bizarre symbols I'm sure he completely understood. This does not mean that I do. That said, I have not asked him whether he understands *Gloria Mundi*’s symbols. (1)
2. They're really busy, and some of them have noncompete agreements that say they can't work on your game. But maybe one of them has a friend you could ask.

3. A dawizard is the ultimate taboo in game editing. In a 16-page section of the 1994 D&D supplement Encyclopedia Magica, Volume 1, an editor haplessly and globally replaced all occurrences of "mage" with "wizard," leading to such epic passages as "The user may look into the ball, concentrate on any place or object, and cause the twizard of the place or object to appear" and "The tower can absorb 200 points of dawizard before collapsing. Dawizard sustained is cumulative, and the fortress cannot be repaired (although a wish restores 10 points of dawizard sustained)." I gleefully used this story to terrify my young editors into straightening up and flying right. I never said I was a nice creative director, just a good one.
The Lessons of Lucasfilm’s Habitat

F. Randall Farmer and Chip Morningstar

Context
This paper was presented at The First Annual International Conference on Cyberspace in 1990. It was published in Cyberspace: First Steps, Michael Benedikt [ed.] [MIT Press, 1990].

Gaming the Game
The Game Design Process
Game Communities

For more than 30 years, F. Randall Farmer has been connecting people with each other using computers as the mediating technology. He has co-created the following: one of the first online forums, the first Trek MUD, the first graphical MMOG with the first avatars, the first virtual MMOG currency, the first virtual information marketplace, the first fully distributed virtual world platform, the first no-plugin web session platform, and more. He continues to publish on these topics.

Chip Morningstar was one of the founders of Electric Communities, a cyberspace design and development company. He was also heavily involved in the initial development of Fujitsu’s WorldsAway service, for which Electric Communities provided creative and technical oversight. Morningstar worked at Lucasfilm Ltd where he was the designer and project leader for Lucasfilm’s Habitat, the world’s first large scale commercial multiperson online graphical virtual world.
Introduction

Lucasfilm’s Habitat was created by Lucasfilm Games, a division of LucasArts Entertainment Company, in association with Quantum Computer Services, Inc. It was arguably one of the first attempts to create a very large scale commercial multi-user virtual environment. A far cry from many laboratory research efforts based on sophisticated interface hardware and tens of thousands of dollars per user of dedicated compute power, Habitat is built on top of an ordinary commercial online service and uses an inexpensive—some would say “toy”—home computer to support user interaction. In spite of these somewhat plebeian underpinnings, Habitat is ambitious in its scope. The system we developed can support a population of thousands of users in a single shared cyberspace. Habitat presents its users with a real-time animated view into an online simulated world in which users can communicate, play games, go on adventures, fall in love, get married, get divorced, start businesses, found religions, wage wars, protest against them, and experiment with self-government.

The Habitat project proved to be a rich source of insights into the nitty-gritty reality of actually implementing a serious, commercially viable cyberspace environment. Our experiences developing the Habitat system, and managing the virtual world that resulted, offer a number of interesting and important lessons for prospective cyberspace architects. The purpose of this paper is to discuss some of these lessons. We hope that the next generation of builders of virtual worlds can benefit from our experiences and (especially) from our mistakes.

Due to space limitations, we won’t be able to go into as much technical detail as we might like; this will have to be left to a future publication. Similarly, we will only be able to touch briefly upon some of the history of the project as a business venture, which is a fascinating subject of its own. Although we will conclude with a brief discussion of some of the future directions for this technology, a more detailed exposition on this topic will also have to wait for a future article.

The essential lesson that we have abstracted from our experiences with Habitat is that a cyberspace is defined more by the interactions among the actors within it than by the technology with which it is implemented. While we find much of the work presently being done on elaborate interface technologies—Data Gloves, head-mounted displays, special-purpose rendering engines, and so on—both exciting and promising, the almost mystical euphoria that currently seems to surround all this hardware is, in our opinion, both excessive and some-
what misplaced. We can't help having a nagging sense that it's all a bit of a distraction from the really pressing issues. At the core of our vision is the idea that cyberspace is necessarily a *multiple-participant environment*. It seems to us that the things that are important to the inhabitants of such an environment are the capabilities available to them, the characteristics of the other people they encounter there, and the ways these various participants can affect one another. Beyond a foundation set of communications capabilities, the technology used to present this environment to its participants, while sexy and interesting, is a peripheral concern.

**What Is Habitat?**

*Habitat* is a “multi-player online virtual environment” (its purpose is to be an entertainment medium; consequently, the users are called “players”). Each player uses his or her home computer as a front end, communicating over a commercial packet-switching data network to a centralized backend system. The front end provides the user interface, generating a real-time animated display of what is going on and translating input from the player into requests to the backend. The backend maintains the world model, enforcing the rules and keeping each player's front end informed about the constantly changing state of the universe. The backend enables the players to interact not only with the world but also with each other.

Habitat was inspired by a long tradition of “computer hacker science fiction”, notably Vernor Vinge’s novel, True Names¹, as well as many fond childhood memories of games of make-believe, more recent memories of role-playing games and the like, and numerous other influences too thoroughly blended to pinpoint. To this we add a dash of silliness, a touch of cyberpunk,² ³ and a predilection for object-oriented programming.⁴

The initial incarnation of *Habitat* uses a Commodore 64 for the frontend. One of the questions we are asked most frequently is, “Why the Commodore 64?” Many people somehow get the impression that this was technical decision, but the real explanation has to do with business, not technology. *Habitat* was initially developed by Lucasfilm as commercial product for QuantumLink, an online service (then) exclusively for owners of the Commodore 64. At the time we started (1985), the Commodore 64 was the mainstay of the recreational computing market. Since then it has declined dramatically in both its commercial and technical significance. However, when we began the project, we didn’t get a choice of platforms. The nature of the deal was such that both the Commodore 64 for the front end and the existing Quantum Link host system (a brace of Stratus fault-tolerant minicomputers) for the backend were givens.
The largest part of the screen is devoted to the graphics display. This is an animated view of the player’s current location in the Habitat world. The scene consists of various objects arrayed on the screen, such as the houses and tree you see here. The players are represented by animated figures that we call “Avatars.” Avatars are usually, though not exclusively, humanoid in appearance. In this scene you can see two of them, carrying on a conversation.

Avatars can move around, pick up, put down and manipulate objects, talk to each other, and gesture, each under the control of an individual player. Control is through the joystick, which enables the player to point at things and issue commands. Talking is accomplished by typing on the keyboard. The text that a player types is displayed over his or her Avatar’s head in a cartoon-style “word balloon”.

The Habitat world is made up of a large number of discrete locations that we call “regions.” In its prime, the prototype Habitat world consisted of around 20,000 of them. Each region can adjoin up to four other regions, which can be reached simply by walking your Avatar to one or another edge of the screen. Doorways and other passages can connect to additional regions. Each region contains a set of objects which define the things that an Avatar can do there and the scene that the player sees on the computer screen.

Some of the objects are structural, such as the ground or the sky. Many are just scenic, such as the tree or the mailbox. Most objects, however, have some function that they perform.
For example, doors transport Avatars from one region to another and may be opened, closed, locked and unlocked. ATMs (Automatic Token Machines) enable access to an Avatar’s bank account. Vending machines dispense useful goods in exchange for Habitat money. Habitat contained its own fully-fledged economy, with money, banks, and so on. Habitat’s unit of currency is the Token, owing to the fact that it is a token economy and to acknowledge the long and honorable association between tokens and video games.

<table>
<thead>
<tr>
<th>Object Class</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM</td>
<td>Automatic Token Machine; access to an Avatar’s bank account</td>
</tr>
<tr>
<td>Avatar</td>
<td>Represents the player in the Habitat world</td>
</tr>
<tr>
<td>Bag, Box</td>
<td>Containers in which things may be carried</td>
</tr>
<tr>
<td>Book</td>
<td>Document for Avatars to read [e.g., the daily newspaper]</td>
</tr>
<tr>
<td>Bureaucrat-in-a-box</td>
<td>Communication with system operators</td>
</tr>
<tr>
<td>Change-o-matic</td>
<td>Device to change Avatar gender</td>
</tr>
<tr>
<td>Chest, Safe</td>
<td>Containers in which things can be stored</td>
</tr>
<tr>
<td>Club, Gun, Knife</td>
<td>Various weapons</td>
</tr>
<tr>
<td>Compass</td>
<td>Points direction to West Pole</td>
</tr>
<tr>
<td>Door</td>
<td>Passage from one region to another; can be locked</td>
</tr>
<tr>
<td>Drugs</td>
<td>Various types; changes Avatar body state, e.g., cure wounds</td>
</tr>
<tr>
<td>Elevator</td>
<td>Transportation from one floor of a tall building to another</td>
</tr>
<tr>
<td>Flashlight</td>
<td>Provides light in dark places</td>
</tr>
<tr>
<td>Fountain</td>
<td>Scenic highlight; provides communication to system designers</td>
</tr>
<tr>
<td>Game piece</td>
<td>Enables various board games: backgammon, checkers, chess, etc.</td>
</tr>
<tr>
<td>Garbage can</td>
<td>Disposes of unwanted objects</td>
</tr>
<tr>
<td>Glue</td>
<td>System building tool; attaches objects together</td>
</tr>
<tr>
<td>Ground, Sky</td>
<td>The underpinnings of the world</td>
</tr>
<tr>
<td>Head</td>
<td>An Avatar’s head; comes in many styles; for customization</td>
</tr>
<tr>
<td>Key</td>
<td>Unlocks doors and other containers</td>
</tr>
<tr>
<td>Knick-knack</td>
<td>Generic inert object; for decorative purposes</td>
</tr>
<tr>
<td>Magic wand</td>
<td>Various types, can do almost anything</td>
</tr>
<tr>
<td>Paper</td>
<td>For writing notes, making maps, etc.; used in mail system</td>
</tr>
<tr>
<td>Pawn machine</td>
<td>Buys back previously purchased objects</td>
</tr>
<tr>
<td>Plant, Rock, Tree</td>
<td>Generic scenic objects</td>
</tr>
<tr>
<td>Region</td>
<td>The foundation of reality</td>
</tr>
<tr>
<td>Sensor</td>
<td>Various types, detects otherwise invisible conditions in the world</td>
</tr>
<tr>
<td>Sign</td>
<td>Allows attachment of text to other objects</td>
</tr>
<tr>
<td>Stun gun</td>
<td>Non-lethal weapon</td>
</tr>
<tr>
<td>Teleport booth</td>
<td>Means of quick long-distance transport; analogous to phone booth</td>
</tr>
<tr>
<td>Tokens</td>
<td>Habitat money</td>
</tr>
<tr>
<td>Vendroid</td>
<td>Vending machine; sells things</td>
</tr>
</tbody>
</table>
Many objects are portable and may be carried around in an Avatar’s hands or pockets. These include various kinds of containers, money, weapons, tools, and exotic magical implements. Listed here are some of the most important types of objects and their functions. The complete list of object types numbers in the hundreds.

**Implementation**

The following, along with several programmer-years of tedious and expensive detail that we won’t cover here, is how the system works:

At the heart of the *Habitat* implementation is an object-oriented model of the universe.

The front end consists of a system kernel and a collection of objects. The kernel handles memory management, display generation, disk I/O, telecommunications, and other “operating system” functions. The objects implement the semantics of the world itself. Each type of *Habitat* object has a definition consisting of a set of resources, including animation cells to drive the display, audio data, and executable code. An object’s executable code implements a series of standard behaviors, each of which is invoked by a different player command or system event. The model is similar to that found in an object-oriented programming system such as Smalltalk, with its classes, methods and messages. These resources consume significant amounts of scarce front end memory, so we can’t keep them all in core at the same time. Fortunately, their definitions are invariant, so we simply swap them in from disk as we need them, discarding less recently used resources to make room.

When an object is instantiated, we allocate a block of memory to contain the object’s state. The first several bytes of an object’s state information take the same form in all objects, and include such things as the object’s screen location and display attributes. This standard information is interpreted by the system kernel as it generates the display and manages the run-time environment. The remainder of the state information varies with the object type and is accessed only by the object’s behavior code.

Object behaviors are invoked by the kernel in response to player input. Each object responds to a set of standard verbs that map directly onto the commands available to the player. Each behavior is simply a subroutine that executes the indicated action; to do this it may invoke the behaviors of other objects or send request messages to the backend. Besides the standard verb behaviors, objects may have additional behaviors which are invoked by messages that arrive synchronously from the backend.
The backend also maintains an object-oriented representation of the world. As in
the front end, objects on the backend possess executable behaviors and in-memory state
information. In addition, since the backend maintains a persistent global state for the entire
Habitat world, the objects are also represented by database records that may be stored on
disk when not "in use." Backend object behaviors are invoked by messages from the front
end. Each of these backend behaviors works in roughly the same way: a message is received
from a player’s front end requesting some action; the action is taken and some state changes
to the world result; the backend behavior sends a response message back to the front end
informing it of the results of its request and notification messages to the front ends of any
other players who are in the same region, informing them of what has taken place.

The Lessons

In order to say as much as we can in the limited space available, we will describe what we
think we learned via a series of principles or assertions surrounded by supporting reason-
ing and illustrative anecdotes. A more formal and thorough exposition will have to come later
in some other forum where we might have the space to present a more comprehensive and
detailed model.

We mentioned our primary principle above:

A multi-user environment is central to the idea of cyberspace.

It is our deep conviction that a definitive characteristic of a cyberspace system is that
it represents a multi-user environment. This stems from the fact that what [in our opinion]
people seek in such a system is richness, complexity and depth. Nobody knows how to produce
an automaton that even approaches the complexity of a real human being, let alone a society.
Our approach, then, is not even to attempt this, but instead to use the computational medium
to augment the communications channels between real people.

If what we are constructing is a multi-user environment, it naturally follows that
some sort of communications capability must be fundamental to our system. However, we
must take into account an observation that is the second of our principles:

Communications bandwidth is a scarce resource.

This point was rammed home to us by one of Habitat’s nastier externally imposed de-
sign constraints, namely that it provide a satisfactory experience to the player over a 300 baud
serial telephone connection line, moreover, routed through commercial packet-switching
networks that impose an additional, uncontrollable latency of 100 to 5000 milliseconds on each packet transmitted).

Even in a more technically advanced network, however, bandwidth remains scarce in the sense that economists use the term: available carrying capacity is not unlimited. The law of supply and demand suggests that no matter how much capacity is available, you always want more. When communications technology advances to the point were we all have multi-gigabaud fiber optic connections into our homes, computational technology will have advanced to match. Our processors’ expanding appetite for data will mean that the search for ever more sophisticated data compression techniques will still be a hot research area (though what we are compressing may at that point be high-resolution volumetric time-series or something even more esoteric).  

Computer scientists tend to be reductionists who like to organize systems in terms of primitive elements that can be easily manipulated within the context of a simple formal model. Typically, you adopt a small variety of very simple primitives which are then used in large numbers. For a graphics-oriented cyberspace system, the temptation is to build upon bit-mapped images or polygons or some other graphic primitive. These sorts of representations, however, are invitations to disaster. They arise from an inappropriate fixation on display technology, rather than on the underlying purpose of the system.

However, the most significant part of what we wish to be communicating is human behaviors. These, fortunately, can be represented quite compactly, provided we adopt a relatively abstract, high-level description that deals with behavioral concepts directly. This leads to our third principle:

*An object-oriented data representation is essential.*

Taken at its face value, this assertion is unlikely to be controversial, as object-oriented programming is currently the methodology of choice among the software engineering cognoscenti. However, what we mean here is not only that you should adopt an object-oriented approach, but that the basic objects from which you build the system should correspond more-or-less to the objects in the user's conceptual model of the virtual world, that is, people, places, and artifacts. You could, of course, use object-oriented programming techniques to build a system based on, say, polygons, but that would not help to cope with the fundamental problem.
The goal is to enable the communications between machines to take place primarily at the behavioral level (what people and things are doing) rather than at the presentation level (how the scene is changing). The description of a place in the virtual world should be in terms of what is there rather than what it looks like. Interactions between objects should be described by functional models rather than by physical ones. The computation necessary to translate between these higher-level representations and the lower-level representations required for direct user interaction is an essentially local function. At the local processor, display-rendering techniques may be arbitrarily elaborate and physical models arbitrarily sophisticated. The data channel capacities required for such computations, however, need not and should not be squeezed into the limited bandwidth available between the local processor and remote ones. Attempting to do so just leads to disasters such as NAPLPS.\textsuperscript{7,8}

Once we begin working at the conceptual rather than the presentation level, we are struck by the following observation:

\textit{The implementation platform is relatively unimportant.}

The presentation level and the conceptual level cannot (and should not) be \textit{totally} isolated from each other. However, defining a virtual environment in terms of the configuration and behavior of objects, rather than their presentation, enables us to span a vast range of computational and display capabilities among the participants in a system. This range extends both upward and downward. As an extreme example, a typical scenic object, such as a tree, can be represented by a handful of parameter values. At the lowest conceivable end of things might be an ancient Altair 8800 with a 300 baud ASCII dumb terminal, where the interface is reduced to fragments of text and the user sees the humble string so familiar to the players of text adventure games, "There is a tree here." At the high end, you might have a powerful processor that generates the image of the tree by growing a fractal model and rendering it three dimensions at high resolution, the finest details ray-traced in real-time, complete with branches waving in the breeze and the sound of wind in the leaves coming through your headphones in high-fidelity digital stereo. And these two users might be looking at the same tree in same the place in the same world and talking to each other as they do so. Both of these scenarios are implausible at the moment, the first because nobody would suffer with such a crude interface when better ones are so readily available, the second because the computational hardware does not yet exist. The point, however, is that this approach covers
the ground between systems already obsolete and ones that are as yet gleams in their designers' eyes. Two consequences of this are significant. The first is that we can build effective cyberspace systems today. Habitat exists as ample proof of this principle. The second is that it is conceivable that with a modicum of cleverness and foresight you could start building a system with today's technology that could evolve smoothly as the tomorrow's technology develops. The availability of pathways for growth is important in the real world, especially if cyberspace is to become a significant communications medium [as we obviously think it should].

Given that we see cyberspace as fundamentally a communications medium rather than simply a user interface model, and given the style of object-oriented approach that we advocate, another point becomes clear:

*Data communications standards are vital.*

However, our concerns about cyberspace data communications standards center less upon data transport protocols than upon the definition of the data being transported. The mechanisms required for reliably getting bits from point A to point B are not terribly interesting to us. This is not because these mechanisms are not essential (they obviously are) nor because they do not pose significant research and engineering challenges (they clearly do). It is because we are focused on the unique communications needs of an object-based cyberspace. We are concerned with the protocols for sending messages between objects, that is, for communicating behavior rather than presentation, and for communicating object definitions from one system to another.

Communicating object definitions seems to us to be an especially important problem, and one that we really didn't have an opportunity to address in Habitat. It will be necessary to address this problem if we are to have a dynamic system. The ability to add new classes of objects over time is crucial if the system is to be able to evolve.

While we are on the subject of communications standards, we would like to make some remarks about the ISO Reference Model of Open System Interconnection. This multi-layered model has become a centerpiece of most discussions about data communications standards these days. Unfortunately, while the bottom 4 or 5 layers of this model provide a more or less sound framework for considering data transport issues, we feel that the model's Presentation and Application layers are not so helpful when considering cyberspace data communications.
We have two main quarrels with the ISO model: first, it partitions the general data communications problem in a way that is a poor match for the needs of a cyberspace system; second, and more importantly, we think it is an active source of confusion because it focuses the attention of system designers on the wrong set of issues and thus leads them to spend their time solving the wrong set of problems. We know because this happened to us. "Presentation" and "Application" are simply the wrong abstractions for the higher levels of a cyberspace communications protocol. A "Presentation" protocol presumes characteristics of the display are embedded in the protocol. The discussions above should give some indication why we feel such a presumption is both unnecessary and unwise. An "Application" protocol presumes a degree of foreknowledge of the message environment that is incompatible with the sort of dynamically evolving object system we envision.

A better model would be to substitute a different pair of top layers: a Message layer, which defines the means by which objects can address one another and standard methods of encapsulating structured data and encoding low-level data types (e.g., numbers); and a Definition layer built on top of the Message layer, which defines a standard representation for object definitions so that object classes can migrate from machine to machine. One might argue that these are simply Presentation and Application with different labels, but we don’t think the differences are so easily reconciled. In particular, we think the ISO model has, however unintentionally, systematically deflected workers in the field from considering many of the issues that concern us.

**World Building**

There were two sorts of implementation challenges that *Habitat* posed. The first was the problem of creating a working piece of technology—developing the animation engine, the object-oriented virtual memory, the message-passing pseudo operating system, and squeezing them all into the ludicrous Commodore 64 (the backend system also posed interesting technical problems, but its constraints were not as vicious). The second challenge was the creation and management of the *Habitat* world itself. It is the experiences from the latter exercise that we think will be most relevant to future cyberspace designers.

We were initially our own worst enemies in this undertaking, victims of a way of thinking to which we engineers are dangerously susceptible. This way of thinking is characterized by the conceit that all things may be planned in advance and then directly implemented according to the plan’s detailed specification. For persons schooled in the design and construction
of systems based on simple, well-defined and well-understood foundation principles, this is a natural attitude to have. Moreover, it is entirely appropriate when undertaking most engineering projects. It is a frame of mind that is an essential part of a good engineer’s conceptual tool kit. Alas, in keeping with Maslow’s assertion that, “to the person who has only a hammer, all the world looks like a nail”, it is a tool that is easy to carry beyond its range of applicability. This happens when a system exceeds the threshold of complexity above which the human mind loses its ability to maintain a complete and coherent model.

One generally hears about systems crossing the complexity threshold when they become very large. For example, the Space Shuttle and the B-2 bomber are both systems above this threshold, necessitating extraordinarily involved, cumbersome and time-consuming procedures to keep the design under control—procedures that are at once vastly expensive and only partially successful. To a degree, the complexity problem can be solved by throwing money at it. However, such capital intensive management techniques are a luxury not available to most projects. Furthermore, although these dubious “solutions” to the complexity problem are out of reach of most projects, alas the complexity threshold itself is not. Smaller systems can suffer from the same sorts of problems. It is possible to push much smaller and less elaborate systems over the complexity threshold simply by introducing chaotic elements that are outside the designers’ sphere of control or understanding. The most significant such chaotic elements are autonomous computational agents [e.g., other computers]. This is why, for example, debugging even very simple communications protocols often proves surprisingly difficult. Furthermore, a special circle of living Hell awaits the implementors of systems involving that most important category of autonomous computational agents of all, groups of interacting human beings. This leads directly to our next [and possibly most controversial] assertion:

*Detailed central planning is impossible; don’t even try.*

The constructivist prejudice that leads engineers into the kinds of problems just mentioned has received more study from economists and sociologists\(^{10-15}\) than from researchers in the software engineering community. Game and simulation designers are experienced in creating virtual worlds for individuals and small groups. However, they have had no reason to learn to deal with large populations of simultaneous users. Since each user or group is unrelated to the others, the same world can be used over and over again. If you are playing
an adventure game, the fact that thousands of other people elsewhere in the [real] world are playing the same game has no effect on your experience. It is reasonable for the creator of such a world to spend tens or even hundreds of hours crafting the environment for each hour that a user will spend interacting with it, since that user’s hour of experience will be duplicated tens of thousands of times by tens of thousands of other individual users.

Builders of online services and communications networks are experienced in dealing with large user populations, but they do not, in general, create elaborate environments. Furthermore, in a system designed to deliver information or communications services, large numbers of users are simply a load problem rather than a complexity problem. All the users get the same information or services; the comments in the previous paragraph regarding duplication of experience apply here as well. It is not necessary to match the size and complexity of the information space to the size of the user population. While it may turn out that the quantity of information available on a service is a function of the size of the user population, this information can generally be organized into a systematic structure that can still be maintained by a few people. The bulk, wherein the complexity lies, is the product of the users themselves, rather than the system designers—the operators of the system do not have to create all this material. [This observation is the first clue to the solution to our problem.]

Our original specification for Habitat called for us to create a world capable of supporting a population of 20,000 Avatars, with expansion plans for up to 50,000. By any reckoning this is a large undertaking and complexity problems would certainly be expected. However, in practice we exceeded the complexity threshold very early in development. By the time the population of our online community had reached around 50 we were in over our heads [and these 50 were “insiders” who were prepared to be tolerant of holes and rough edges].

Moreover, a virtual world such as Habitat needs to scale with its population. For 20,000 Avatars we needed 20,000 “houses”, organized into towns and cities with associated traffic arteries and shopping and recreational areas. We needed wilderness areas between the towns so that everyone would not be jammed together into the same place. Most of all, we needed things for 20,000 people to do. They needed interesting places to visit—and since they can’t all be in the same place at the same time, they needed a lot of interesting places to visit—and things to do in those places. Each of those houses, towns, roads, shops, forests, theaters, arenas, and other places is a distinct entity that someone needs to design and create. We, attempting to play the role of omniscient central planners, were swamped.
Automated tools may be created to aid the generation of areas that naturally possess a high degree of regularity and structure, such as apartment buildings and road networks. We created a number of such tools, whose spiritual descendents will no doubt be found in the standard bag of tricks of future cyberspace architects. However, the very properties which make some parts of the world amenable to such techniques also make those same parts of the world among the least important. It is really not a problem if every apartment building looks pretty much like every other. It is a big problem if every enchanted forest is the same. Places whose value lies in their uniqueness, or at least in their differentiation from the places around them, need to be crafted by hand. This is an incredibly labor intensive and time consuming process. Furthermore, even very imaginative people are limited in the range of variation that they can produce, especially if they are working in a virgin environment uninfluenced by the works and reactions of other designers.

**Running the World**

The world design problem might still be tractable, however, if all players had the same goals, interests, motivations and types of behavior. Real people, however, are all different. For the designer of an ordinary game or simulation, human diversity is not a major problem, since he or she gets to establish the goals and motivations on the participants’ behalf, and to specify the activities available to them in order to channel events in the preferred direction. *Habitat*, however, was deliberately open-ended and pluralistic. The idea behind our world was precisely that it did not come with a fixed set of objectives for its inhabitants, but rather provided a broad palette of possible activities from which the players could choose, driven by their own internal inclinations. It was our intent to provide a variety of possible experiences, ranging from events with established rules and goals [a treasure hunt, for example] to activities propelled by the players’ personal motivations [starting a business, running the newspaper] to completely free-form, purely existential activities [hanging out with friends and conversing]. Most activities, however, involved some degree of pre-planning and setup on our part—we were to be like the cruise director on an ocean voyage, but we were still thinking like game designers.

The first goal-directed event planned for *Habitat* was a rather involved treasure hunt called the “D’nalsi Island Adventure.” It took us hours to design, weeks to build [including a 100-region island], and days to coordinate the actors involved. It was designed much like the puzzles in an adventure game. We thought it would occupy our players for days. In fact, the puzzle was solved in about 8 hours by a person who had figured out the critical clue in the first
15 minutes. Many of the players hadn’t even had a chance to get into the game. The result was that one person had had a wonderful experience, dozens of others were left bewildered, and a huge investment in design and setup time had been consumed in an eye blink. We expected that there would be a wide range of “adventuring” skills in the Habitat audience. What wasn’t so obvious until afterward was that this meant that most people didn’t have a very good time, if for no other reason than that they never really got to participate. It would clearly be foolish and impractical for us to do things like this on a regular basis.

Again and again we found that activities based on often unconscious assumptions about player behavior had completely unexpected outcomes (when they were not simply outright failures). It was clear that we were not in control. The more people we involved in something, the less in control we were. We could influence things, we could set up interesting situations, we could provide opportunities for things to happen, but we could not dictate the outcome. Social engineering is, at best, an inexact science (or, as some wag once said, “In the most carefully constructed experiment under the most carefully controlled conditions, the organism will do whatever it damn well pleases”).

Propelled by these experiences, we shifted into a style of operations in which we let the players themselves drive the direction of the design. This proved far more effective. Instead of trying to push the community in the direction we thought it should go, an exercise rather like herding mice, we tried to observe what people were doing and aid them in it. We became facilitators as much as we were designers and implementers. This often meant adding new features and new regions to the system at a frantic pace, but almost all of what we added was used and appreciated, since it was well matched to people’s needs and desires. We, as the experts on how the system worked, could often suggest new activities for people to try or ways of doing things that people might not have thought of. In this way we were able to have considerable influence on the system’s development in spite of the fact that we didn’t really hold the steering wheel—more influence, in fact, than we had had when we were operating under the illusion that we controlled everything.

Indeed, the challenges posed by large systems are prompting some researchers to question the centralized, planning dominated attitude that we have criticized here, and to propose alternative approaches based on evolutionary and market principles. These principles appear applicable to complex systems of all types, not merely those involving interacting human beings.
The Great Debate
Among the objects we made available to Avatars in Habitat were guns and various other sorts of weapons. We included these because we felt that players should be able to materially effect each other in ways that went beyond simply talking, ways that required real moral choices to be made by the participants. We recognized the age-old story-teller’s dictum that conflict is the essence of drama. Death in Habitat was, of course, not like death in the real world! When an Avatar is killed, he or she is teleported back home, head in hands (literally), pockets empty, and any object in hand at the time dropped on the ground at the scene of the crime. Any possessions carried at the time are lost. It was more like a setback in a game of “Chutes and Ladders” than real mortality. Nevertheless, the death metaphor had a profound effect on people’s perceptions. This potential for murder, assault and other mayhem in Habitat was, to put it mildly, controversial. The controversy was further fueled by the potential for lesser crimes. For instance, one Avatar could steal something from another Avatar simply by snatching the object out its owner’s hand and running off with it.

We had imposed very few rules on the world at the start. There was much debate among the players as to the form that Habitat society should take. At the core of much of the debate was an unresolved philosophical question: is an Avatar an extension of a human being (thus entitled to be treated as you would treat a real person) or a Pac-Man-like critter destined to die a thousand deaths or something else entirely? Is Habitat murder a crime? Should all weapons be banned? Or is it all ”just a game”? To make a point, one of the players took to randomly shooting people as they roamed around. The debate was sufficiently vigorous that we took a systematic poll of the players. The result was ambiguous: 50% said that Habitat murder was a crime and shouldn’t be a part of the world, while the other 50% said it was an important part of the fun.

We compromised by changing the system to allow thievery and gunplay only outside the city limits. The wilderness would be wild and dangerous while civilization would be orderly and safe. This did not resolve the debate, however. One of the outstanding proponents of the anti-violence point of view was motivated to open the first Habitat church, the Order of the Holy Walnut (in real life he was a Greek Orthodox priest). His canons forbid his disciples to carry weapons, steal, or participate in violence of any kind. His church became quite popular and he became a very highly respected member of the Habitat community.
Furthermore, while we had made direct theft impossible, one could still engage in indirect theft by stealing things set on the ground momentarily or otherwise left unattended. And the violence still possible in the outlands continued to bother some players. Many people thought that such crimes ought to be prevented or at least punished somehow, but they had no idea how to do so. They were used to a world in which law and justice were always things provided by somebody else. Somebody eventually made the suggestion that there ought to be a Sheriff. We quickly figured out how to create a voting mechanism and rounded up some volunteers to hold an election. A public debate in the town meeting hall was heavily attended, with the three Avatars who had chosen to run making statements and fielding questions. The election was held, and the town of Populopolis acquired a Sheriff.

For weeks the Sheriff was nothing but a figurehead, though he was a respected figure and commanded a certain amount of moral authority. We were stumped about what powers to give him. Should he have the right to shoot anyone anywhere? Give him a more powerful gun? A magic wand to zap people off to jail? What about courts? Laws? Lawyers? Again we surveyed the players, eventually settling on a set of questions that could be answered via a referendum. Unfortunately, we were unable to act on the results before the pilot operations ended and the system was shut down. It was clear, however, that there are two basic camps: anarchy and government. This is an issue that will need to be addressed by future cyberspace architects. However, our view is that a virtual world need not be set up with a “default” government, but can instead evolve one as needed.

A Warning
Given the above exhortation that control should be released to the users, we need to inject a note of caution and present our next assertion:

*You can’t trust anyone.*

This may seem like a contradiction of much of the preceding, but it really is not. Designers and operators of a cyberspace system must inhabit two levels of virtual world at once. The first we call the “infrastructure level”, which is the implementation, where the laws that govern “reality” have their genesis. The second we call the “peripient level”, which is what the users see and experience. It is important that there not be “leakage” between these two levels. The first level defines the physics of the world. If its integrity is breached, the consequences can range from aesthetic unpleasantness (the audience catches a glimpse of
the scaffolding behind the false front] to psychological disruption [somebody does something “impossible”, thereby violating users’ expectations and damaging their fantasy] to catastrophic failure [somebody crashes the system]. When we exhort you to give control to the users, we mean control at the percipient level. When we say that you can’t trust anyone, we mean that you can’t trust them with access to the infrastructure level. Some stories from Habitat will illustrate this.

When designing a piece of software, you generally assume that it is the sole intermediary between the user and the underlying data being manipulated (possibly multiple applications will work with the same data, but the principle remains the same). In general, the user need not be aware of how data are encoded and structured inside the application. Indeed, the very purpose of a good application is to shield the user from the ugly technical details. It is conceivable that a technically astute person who is willing to invest the time and effort could decipher the internal structure of things, but this would be an unusual thing to do as there is rarely much advantage to be gained. The purpose of the application itself is, after all, to make access to and manipulation of the data easier than digging around at the level of bits and bytes. There are exceptions to this, however. For example, most game programs deliberately impose obstacles on their players in order for play to be challenging. By tinkering around with the insides of such a program—dumping the data files and studying them, disassembling the program itself and possibly modifying it—it may be possible to “cheat.” However, this sort of cheating has the flavor of cheating at solitaire: the consequences adhere to the cheater alone. There is a difference, in that disassembling a game program is a puzzle-solving exercise in its own right, whereas cheating at solitaire is pointless, but the satisfactions to be gained from it, if any, are entirely personal.

If, however, a computer game involves multiple players, delving into the program’s internals can enable one to truly cheat, in the sense that one gains an unfair advantage over the other players of which they may be unaware. Habitat is such a multi-player game. When we were designing the software, our “prime directive” was, “The backend shall not assume the validity of anything a player computer tells it.” This is because we needed to protect ourselves against the possibility that a clever user had hacked around with his copy of the front end program to add “custom features.” For example, we could not implement any of the sort of “skill and action” elements found in traditional video games wherein dexterity with the joystick determines the outcome of, say, armed combat, because you couldn’t guard against
someone modifying their copy of the program to tell the backend that they had “hit,” whether they actually had or not. Indeed, our partners at QuantumLink warned us of this very eventuality before we even started—they already had users who did this sort of thing with their regular system. Would anyone actually go to the trouble of disassembling and studying 100K or so of incredibly tight and bizarrely threaded 6502 machine code just to tinker? As it turns out, the answer is yes. People have. We were not 100% rigorous in following our own rule. It turned out that there were a few features whose implementation was greatly eased by breaking the rule in situations where, in our judgment, the consequences would not be material if people “cheated” by hacking their own systems. Darned if people didn’t hack their systems to cheat in exactly these ways.

Care must be taken in the design of the world as well. One incident that occurred during our pilot test involved a small group of players exploiting a bug in our world database which they interpreted as a feature. First, some background. Avatars are hatched with 2000 Tokens in their bank account, and each day that they login they receive another 100T. Avatars may acquire additional funds by engaging in business, winning contests, finding buried treasure, and so on. They can spend their Tokens on, among other things, various items that are for sale in vending machines called Vendroids. There are also Pawn Machines, which will buy objects back [at a discount, of course].

In order to make this automated economy a little more interesting, each Vendroid had its own prices for the items in it. This was so that we could have local price variation [i.e., a widget would cost a little less if you bought it at Jack’s Place instead of The Emporium]. It turned out that in two Vendroids across town from each other were two items for sale whose prices we had inadvertently set lower than what a Pawn Machine would buy them back for: Dolls (for sale at 75T, hock for 100T) and Crystal Balls (for sale at 18,000T, hock at 30,000T!). Naturally, a couple of people discovered this. One night they took all their money, walked to the Doll Vendroid, bought as many Dolls as they could, then took them across town and pawned them. By shuttling back and forth between the Doll Vendroid and the Pawn Shop for hours, they amassed sufficient funds to buy a Crystal Ball, whereupon they continued the process with Crystal Balls and a couple orders of magnitude higher cash flow. The final result was at least three Avatars with hundreds of thousands of Tokens each. We only discovered this the next morning when our daily database status report said that the money supply had quintupled overnight.
We assumed that the precipitous increase in "T1" was due to some sort of bug in the software. We were puzzled that no bug report had been submitted. By poking around a bit we discovered that a few people had suddenly acquired enormous bank balances. We sent Habitat mail to the two richest, inquiring as to where they had gotten all that money overnight. Their reply was, "We got it fair and square! And we're not going to tell you how!" After much abject pleading on our part they eventually did tell us, and we fixed the erroneous pricing. Fortunately, the whole scam turned out well, as the nouveau rich Avatars used their bulging bankrolls to underwrite a series of treasure hunt games which they conducted on their own initiative, much to the enjoyment of many other players on the system.

**Keeping “Reality” Consistent**

The urge to breach the boundary between the infrastructure level and the percipient level is not confined to the players. The system operators are also subject to this temptation, though their motivation is expediency in accomplishing their legitimate purposes rather than the gaining of illegitimate advantage. However, to the degree to which it is possible, we vigorously endorse the following principle:

*Work within the system.*

Wherever possible, things that can be done within the framework of the percipient level should be. The result will be smoother operation and greater harmony among the user community. This admonition applies to both the technical and the sociological aspects of the system.

For example, with the players in control, the *Habitat* world would have grown much larger and more diverse than it did had we ourselves not been a technical bottleneck. All new region generation and feature implementation had to go through us, since there was no means for players to create new parts of the world on their own. Region creation was an esoteric technical specialty, requiring a plethora of obscure tools and a good working knowledge of the treacherous minefield of limitations imposed by the Commodore 64. It also required a lot of behind-the-scenes activity that would probably spoil the illusion for many. One of the goals of a next generation *Habitat*-like system ought to be to permit far greater creative involvement by the participants without requiring them to ascend to full-fledged guru-hood to do so.

A further example of working within the system, this time in a social sense, is illustrated by the following experience. One of the more popular events in *Habitat* took place late in the
test, the brainchild of one of the more active players who had recently become a QuantumLink employee. It was called the "Dungeon of Death'.

For weeks, ads appeared in Habitat's newspaper, The Rant, announcing that that Duo of Dread, DEATH and THE SHADOW, were challenging all comers to enter their lair. Soon, on the outskirts of town, the entrance to a dungeon appeared. Out front was a sign reading, 'Danger! Enter at your own risk!' Two system operators were logged in as DEATH and THE SHADOW, armed with specially concocted guns that could kill in one shot, rather than the usual.¹² These two characters roamed the dungeon blasting away at anyone they encountered. They were also equipped with special magic wands that cured any damage done to them by other Avatars, so that they wouldn't themselves be killed. To make things worse, the place was littered with dead ends, pathological connections between regions, and various other nasty and usually fatal features. It was clear that any explorer had better be prepared to "die" several times before mastering the dungeon. The rewards were pretty good: 1000 Tokens minimum and access to a special Vendroid that sold magic teleportation wands. Furthermore, given clear notice, players took the precaution of emptying their pockets before entering, so that the actual cost of getting "killed" was minimal.

One evening, one of us was given the chance to play the role of DEATH. When we logged in, we found him in one of the dead ends with four other Avatars who were trapped there. We started shooting, as did they. However, the last operator to run DEATH had not bothered to use his special wand to heal any accumulated damage, so the character of DEATH was suddenly and unexpectedly "killed" in the encounter. As we mentioned earlier, when an Avatar is killed, any object in his hands is dropped on the ground. In this case, said object was the special kill-in-one-shot gun, which was immediately picked up by one of the regular players who then made off with it. This gun was not something that regular players were supposed to have. What should we do?

It turned out that this was not the first time this had happened. During the previous night's mayhem the special gun was similarly absconded with. In this case, the person playing DEATH was one of the regular system operators, who, used to operating the regular Q-Link service, simply ordered the player to give the gun back. The player considered that he had obtained the weapon as part of the normal course of the game and balked at this, whereupon the operator threatened to cancel the player's account and kick him off the system if he did not
comply. The player gave the gun back, but was quite upset about the whole affair, as were many of his friends and associates on the system. Their world model had been painfully violated.

When it happened to us, we played the whole incident within the role of DEATH. We sent a message to the Avatar who had the gun, threatening to come and kill her if she didn't give it back. She replied that all she had to do was stay in town and DEATH couldn't touch her (which was true, if we stayed within the system). OK, we figured, she's smart. We negotiated a deal whereby DEATH would ransom the gun for 10,000 Tokens. An elaborate arrangement was made to meet in the center of town to make the exchange, with a neutral third Avatar acting as an intermediary to ensure that neither party cheated. Of course, word got around and by the time of the exchange there were numerous spectators. We played the role of DEATH to the hilt, with lots of hokey melodramatic shtick. The event was a sensation. It was written up in the newspaper the next morning and was the talk of the town for days. The Avatar involved was left with a wonderful story about having cheated DEATH, we got the gun back, and everybody went away happy.

These two very different responses to an ordinary operational problem illustrate our point. Operating within the participants' world model produced a very satisfactory result. On the other hand, what seemed like the expedient course, which involved violating this model, provoked upset and dismay. Working within the system was clearly the preferred course in this case.

**Current Status**

As of this writing, the North American incarnation of Lucasfilm's *Habitat*, QuantumLink's "Club Caribe," has been operating for almost two years. It uses our original Commodore 64 front end and a somewhat stripped-down version of our original Stratus backend software. Club Caribe now sustains a population of some 15,000 participants.

A technically more advanced version, called *Fujitsu Habitat*, has recently started pilot operations in Japan, available on Nifty Serve. The initial front end for this version is the new Fujitsu FM Towns personal computer, though ports to several other popular Japanese machines are anticipated. This version of the system benefits from the additional computational power and graphics capabilities of a newer platform, as well as the Towns' built-in CD-ROM for object imagery and sounds. However, the virtuality of the system is essentially unchanged and Fujitsu has not made significant alterations to the user interface or to any of the underlying concepts.
Future Directions
There are several directions in which this work can be extended. Most obvious is to implement the system on more advanced hardware, enabling a more sophisticated display. A number of extensions to the user interface also suggest themselves. However, the line of development most interesting to us is to expand on the idea of making the development and expansion of the world itself part of the users’ sphere of control. There are two major research areas in this. Unfortunately, we can only touch on them briefly here.

The first area to investigate involves the elimination of the centralized backend. The backend is a communications and processing bottleneck that will not withstand growth above too large a size. While we can support tens of thousands of users with this model, it is not really feasible to support millions. Making the system fully distributed, however, requires solving a number of difficult problems. The most significant of these is the prevention of cheating. Obviously, the owner of the network node that implements some part of the world has an incentive to tilt things in his favor there. We think that this problem can be addressed by secure operating system technologies based on public-key cryptographic techniques.\textsuperscript{19,20}

The second fertile area of investigation involves user configuration of the world itself. This requires finding ways to represent the design and creation of regions and objects as part of the underlying fantasy. Doing this will require changes to our conception of the world. In particular, we don’t think it will be possible to conceal all of the underpinnings to those who work with them. However, all we really need to do is find abstractions for those underpinnings that fit into the fantasy itself. Though challenging, this is, in our opinion, eminently feasible.

Conclusions
We feel that the defining characteristic of cyberspace is the shared virtual environment, not the display technology used to transport users into that environment. Such a cyberspace is feasible today, if you can live without head-mounted displays and other expensive graphics hardware. Habitat serves as an existence proof of this contention.

It seems clear to us that an object-oriented world model is a key ingredient in any cyberspace implementation. We feel we have gained some insight into the data representation and communications needs of such a system. While we think that it may be premature to start establishing detailed technical standards for these things, it is time to begin the discussions that will lead to such standards in the future.
Finally, we have come to believe that the most significant challenge for cyberspace developers is to come to grips with the problems of world creation and management. While we have only made the first inroads onto these problems, a few things have become clear. The most important of these is that managing a cyberspace world is not like managing the world inside a single-user application or even a conventional online service. Instead, it is more like governing an actual nation. Cyberspace architects will benefit from study of the principles of sociology and economics as much as from the principles of computer science. We advocate an agoric, evolutionary approach to worldbuilding rather than a centralized, socialistic one.

We would like to conclude with a final admonition, one that we hope will not be seen as overly contentious:

Get real.

In a discussion of cyberspace on Usenet, one worker in the field dismissed Club Caribe (Habitat's current incarnation) as uninteresting, with a comment to the effect that most of the activity consisted of inane and trivial conversation. Indeed, the observation was largely correct. However, we hope some of the anecdotes recounted above will give some indication that more is going on than those inane and trivial conversations might indicate. Further, to dismiss the system on this basis is to dismiss the users themselves. They are paying money for this service. They don't view what they do as inane and trivial, or they wouldn't do it. To insist this presumes that one knows better than they what they should be doing. Such presumption is another manifestation of the omniscient central planner who dictates all that happens, a role that this entire article is trying to deflect you from seeking. In a real system that is going to be used by real people, it is a mistake to assume that the users will all undertake the sorts of noble and sublime activities which you created the system to enable. Most of them will not. Cyberspace may indeed change humanity, but only if it begins with humanity as it really is.

Notes
Note 1: One of the questions we are asked most frequently is, 'Why the Commodore 64?' Many people somehow get the impression that this was a technical decision, but the real explanation has to do with business, not technology. Habitat was initially developed by Lucasfilm as commercial product for QuantumLink, an online service [then] exclusively for owners of the Commodore 64. At the time we started [1985], the Commodore 64 was the mainstay of the recreational computing market. Since then it has declined dramatically in both its commercial and technical significance. However, when we began the
project, we didn’t get a choice of platforms. The nature of the deal was such that both the Commodore 64
for the frontend and the existing QuantumLink host system (a brace of Stratus fault-tolerant minicom-
puters) for the backend were given.

Note 2: Habitat contains its own fully-fledged economy, with money, banks, and so on. Habitat’s unit of
currency is the Token, reflecting the fact that it is a token economy and to acknowledge the long and hon-
orable association between tokens and video games. Incidentally, the Habitat Token is a 23- sided plastic
coin slightly larger than an American quarter, with a portrait of Vernor Vinge and the motto ‘Fiat Lucre’
on its face, and the text ‘Good for one fare’ on the back; these details are difficult to make out on the
Commodore 64 screen.

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Unwritten Rules

Stephen Sniderman

Context
"Unwritten Rules" is the feature article in the first issue of The Life of Games (October, 1999), the online journal at www.gamepuzzles.com/tlog/tlog.htm, which I co-edit with Kate Jones, founder of Kadon Gamepuzzles. This article is an attempt to clear the ground for discussing games by challenging the widely held assumption that a game is fundamentally different from other human activities (such as the law or business) because we can know all its rules. Games are thus invoked as a model of a fully describable closed system, but I try to show that a game played by humans cannot be a closed system and therefore cannot be fully described.

The Rules of a Game
Gaming the Game
Speaking of Games

Stephen Sniderman has been teaching American literature and creative writing at Youngstown State University since 1969. He has published two books (Language Lovers’ Word Puzzles; Stanley Newman Presents Grid Play), a game system (Flying Colors) with Kadon Gamepuzzles, and dozens of puzzles and games in GAMES Magazine and English Journal.
Regardless of what game you’re playing, you cannot know all the rules.
Whether the "game" is tic-tac-toe, chess, baseball, language, etiquette, education, science, religion, law, business, politics or war, the entire set of rules governing the system cannot be spelled out. No matter how hard we try to indicate what is required, allowed, and proscribed, some of the most fundamental principles of playing the game will always elude us. And yet, paradoxically, we can still play the game—some deeper rules are always operating (i.e., affecting the players’ behavior) without the players’ being aware of them.

What do we mean by a game?
A game is a play activity that consists of an object (a goal or goals that the players are trying to accomplish) and constraints on the players’ behavior (what they must do and/or what they may not do in attempting to achieve the game’s object). To play a game is to pursue that game’s object while adhering (more or less) to its constraints. Some of these constraints (the "recorded rules") are explicitly spelled out and are what we generally understand to be "the rules of the game," but every game is also governed by constraints that are rarely if ever made explicit. Some of these "unrecorded rules" are literally unstateable.

An example with tic-tac-toe
Suppose I challenge you to a game of tic-tac-toe. Could anything be more straightforward? But just to be sure, we review the rules. We’ll play on a 3x3 grid, we’ll alternate turns, we’ll play only in empty squares, I’ll play X’s, you play O’s, I’ll play first, and the first player to get three of his/her symbol in a row, column, or diagonal wins the game. Aren’t these all the rules of tic-tac-toe?

Well, for one thing, nothing has been said about time. Is there a time limit between moves? Normally, we both "understand" that there is, and we both "know" that our moves should be made within a "reasonable" time, say 20 seconds. If one of us takes longer, the other starts to fidget or act bored, may even make not-so-subtle comments, and eventually threaten to quit. Without having stated it, we have accepted a tacit time limit. And because we haven’t stated it, it is fairly flexible and very functional.

Is it a rule, or isn’t it?
Suppose it is my turn and, no matter what I do, you will win on your next move. Couldn’t I prevent that from happening, within the rules stated, by simply refusing to play? Nothing in the
rules forces me to move within a particular amount of time, so I simply do not make my next move. Haven’t I followed the rules and avoided losing? And yet, if you’ve ever played a game, you know that this strategy is almost never employed and would be completely unacceptable. Anybody who seriously resorted to such a tactic would be considered childish, unsportsman-like, or socially undesirable and would probably not be asked to play in the future. This behavior seems to violate some fundamental but rarely stated principle of the game without any of us ever having to discuss it.

**Self-defeating rules**

But can’t we state the principle it violates? Can’t we just make that principle one of the rules of tic-tac-toe and other games? The answer is—yes, of course we can, but we will not eliminate the problem. Suppose we add the following rule: *Players will make their moves within a reasonable amount of time.* Have we solved anything? What is a “reasonable” amount of time? One minute? Five? 30? A million? And who determines what is reasonable—the player whose turn it is or the other player?

Such a rule is actually self-defeating because it calls attention to the fact that we cannot spell out what “reasonable” means.

So why not just specify a time limit for each move? Because we would just create even more perplexing problems for ourselves. For one thing, we would have to indicate when a player’s time is running and when it is not. If one player had to answer the phone, for example, would we count that time or wouldn’t we? To state the rule fully, we would have to list every life situation that could possibly interrupt a player’s turn and state whether it should count against that player’s time limit. Obviously, we could never complete such a list.

**Practical solutions**

A far more practical “solution,” the one most of us have used all our lives in “friendly” games, is to say nothing about time limits and rely on our opponent’s intuitive understanding of a “reasonable” time for a move and his/her desire to keep the game moving and therefore enjoyable. In other words, we depend on unstated—and probably unstateable—“rules” (really just expectations) when we play a game for fun.

In tournament or professional games, of course, we cannot leave things so loose, and various methods have been employed to solve the time dilemma. Generally, specific time limits are spelled out, as are specific penalties, including forfeit, for exceeding them. Official
devices are employed for timing moves—chess clocks, the shot-clock in college and pro basketball, stopwatches in baseball games and tennis tournaments, and so on. But once we move beyond “reasonable” to “official” time, we create a whole new set of problems, problems that can no longer be solved with a simple agreement between or among players.

**Rulings versus rules**
As any sports fan knows, the difficulties that arise with “official” rules and “officials” to interpret them are often more intractable than those we face in friendly games. Since no set of rules can list every possible situation that might come up during tournament play, someone in charge, rather than the players themselves, must decide if a player has violated a rule (such as exceeding a time limit) and what penalty should be invoked.

Suppose, for instance, that a fire alarm sounds during a chess tournament and players are forced to evacuate the room. Someone in charge of the tournament must determine whether or not the time spent out of the room should be counted against the players whose clocks were running. It is doubtful that the tournament rules will help them. Or suppose the shot clock in an NBA game stops functioning temporarily. When it is fixed, the officials must decide how much time to put on the clock. How could any rule specify the precise amount of time that would be appropriate? Or suppose a professional tennis player complains of cramps. A human being, not a rulebook, must determine whether the player’s complaint is legitimate and decide whether to grant the player additional time to recover.

Presumably, the officials’ decisions in these situations would be based on the notions of fairness, sportsmanship, and practicality, notions that have never been—and almost certainly cannot be—fully codified and agreed upon. Therefore, no matter how exhaustive and specific we try to make the rules about time limits (or anything else) in a game, we will always have to rely on other people’s acceptance of a set of principles that neither they nor we can put into words. That’s the nature of any human system—the most important aspects of it are unstatable and unknowable.

In *The Celebrant*, Eric Rolfe Greenberg cogently illustrates this little-recognized truth. He depicts the famous incident in baseball lore that got Bonehead Merkle his nickname. With two outs in the bottom of the ninth inning and the score tied, Merkle is on first and a teammate is on third. The next batter hits the ball cleanly into right field for a single, which drives in the apparent game-winning run. Fans pour out onto the field in celebration. Merkle, afraid for his safety, heads directly to the dugout without touching second base. The fielding
team calls for an appeal play at second and attempts to retrieve the ball and touch second for
the third out, ending the inning and negating the tie-breaking run.

But where is the ball? No one is sure because the field is swarming with fans. Ne-
evertheless, one of the fielders, holding a ball, touches second base and claims that Merkle has
been forced out and that the game is still tied. The question arises, is the ball he retrieved the
one that was actually hit? By this time, the umpire has left the field and must be summoned
from his dressing room, which he adamantly refuses to leave—until his life is threatened.
When he does finally stick his head out, he refuses to change his ruling. Naturally, the losing
team appeals to the commissioner of baseball to settle the matter. This worthy stalls as long
as he can and finally declares the game null and void and orders that it be replayed.

Greenberg makes it clear that the commissioner’s decision is influenced by political
and social considerations that have little to do with any rulebook. The game of baseball has
spilled over into real life and the depth of the “rules” governing the sport can be glimpsed.

No game is an island
As this example reminds us, no game or sport is played in a vacuum. All play activities exist
in a “real-world” context, so to play the game is to immerse yourself in that context, whether
you want to or not. In fact, it is impossible to determine where the “game” ends and “real life”
begins. As a result, knowing only the recorded rules of a game is never enough to allow you
to play the game.

Think of the constraints that do not ordinarily get included as part of the recorded
rules of tic-tac-toe but which nevertheless influence the behavior of almost all players. Some
of these involve the conventions, “etiquette,” or “ethos” of this particular game and may vary
from region to region or even family to family.

For example, I would guess that few tic-tac-toe players talk trash to each other [an
acceptable and even expected behavior in some games and sports, like basketball].

Similarly, I’m willing to bet that few people play tic-tac-toe for money [in contrast to
Poker] or prizes [as is sometimes true with Scrabble] or masters points [as with Tournament
Bridge] or glory [as in Central Park chess].

Also, most people, I suspect, would probably allow their opponent, especially an inex-
perienced player or a young child, the opportunity to “take back” an obviously unwise move.
Playing fair
Other unwritten rules are associated with being "a good sport" and would apply to virtually all games in our culture. For example, you may not attempt to coerce your opponent, through physical force or threats or bribery or blackmail, into putting a symbol on a particular square. You may not attempt to cause your opponent physical, mental, or emotional harm to keep him or her from competing effectively. You may not attempt to distract your opponent while he or she is contemplating the next move. On the other hand, you must make your moves in a "reasonable" time. You must take the game seriously and attempt to win. You must play "fair" at all times.

To understand the difficulty—or, more accurately, the impossibility—of spelling out every rule governing the behavior of tic-tac-toe players, try to imagine programming a computer to "understand" what is meant by the sentences in the previous paragraph. For instance, think about the notion of "distracting" an opponent. What counts and what doesn't? Suppose you are chewing gum or smoking or wearing perfume and your opponent claims to be bothered by the sounds or aromas you are producing. What would we tell Deep Blue about this situation? Can we really list every behavior that qualifies as distracting?

The human factor
Or for that matter, can we ever be sure [in the sense that we could program a computer to determine] that a player is "really" distracted? In his famous match with Boris Spassky in Reykjavik, Iceland, in 1972, Bobby Fischer claimed to be "distracted" by negative vibes that were emanating from his opponent's camp. Officials could hardly appeal to the recorded rules, as "complete" as those might have been, to determine how to handle Fischer's complaints. They had to use their experience with people, including Fischer and Spassky, their understanding of human psychology, their awareness of the political and social implications of the situation, and their diplomatic skills to arrive at a satisfactory compromise. Which of these notions is programmable?

Even Deep Blue, the most sophisticated chess program ever devised, cannot distinguish between a game played for blood (or money) and one played for fun; cannot recognize when a move should count and when politeness or common sense or common courtesy or compassion or medical emergency dictates that it shouldn't; cannot take into account the emotional needs of its opponent; cannot know when it's appropriate to abandon the game
or suspend play; cannot, in short, understand the social, political, moral, psychological, and philosophical context in which the game occurs.

**Unspoken basics**

Obviously, our ability to participate in a particular game is dependent on our knowledge of many "rules" which no one has ever spelled out to us. Yet it is easy to overlook this simple fact. In *When Elephants Weep*, the authors tell about a group of scientists who attempted to teach dolphins to play water polo. Although the dolphins were able to learn how to put the ball in the net (and seemed to derive pleasure from doing so), when the trainers tried to get them to stop the other team from "scoring," the dolphins launched an all-out war on the other team's players, using methods that no person steeped in the concepts of sportspeopleship would ever use.

After this experience, the trainers gave up their effort, apparently concluding that their task was hopeless, that dolphins couldn't be taught to play the sport. My guess is that they assumed that all the dolphins needed to be taught were the recorded rules of water polo and the creatures would be able to play the game like adult human beings. These scientists evidently did not realize how much of our knowledge of proper game behavior precedes the learning of the statable constraints of a particular sport.

But suppose these trainers had recognized, after their initial failure, that they had to provide their trainees with some more fundamental "rules" of game playing. Would they ever have been able to teach dolphins all they need to know to play a single "human" game? Are dolphins capable of understanding fairness and sportscreatureship, "time in" vs. "time out," practice vs. competition, winning and losing? And even if they were, how would we go about teaching these concepts to them? Wouldn't we have to teach them much of our culture in order for them to play the game as we do?

**Sportsmanship 101**

To grasp the immensity of the trainers' task, let us look more closely at what we must know and do to play the simplest game in our culture. We must:

1. intuitively understand what is meant by *play* in our culture, recognize how it differs from other activities, and be able to tell when someone is involved in the behaviors associated with play in general and games in particular;
2. intuitively understand what game/sport is being played, which behaviors constitute part of that activity and which do not, when the activity is underway, when it is in suspension, and when it is concluded;

3. consciously understand and pursue the object(s) of the game (i.e., what we must accomplish to be "successful");

4. consciously understand and follow all (or at least a large majority of) the defining prescriptions and proscriptions of the game, the "written," statable rules—i.e., what we must and must not do in the course of pursuing the object or objects;

5. consciously understand and follow the etiquette of the game—i.e., the unwritten but sometimes stated traditions associated with the game that do not necessarily affect the play itself (e.g., appropriateness of talking, gloating, taunting, celebrating, stalling, replaying a point, giving advice to your opponent or teammates, letting players take back moves, etc.);

6. intuitively understand and follow the ethos of that particular game—i.e., the unwritten and rarely expressed assumptions about how to interpret and enforce the "written" rules (e.g., palming in basketball; the strike zone in American and National Leagues; the foot-fault in tennis);

7. intuitively understand and follow the conventions of playing any game according to the culture of the participants—i.e., the unwritten and generally unstatable customs related to playing, competing, winning/losing, etc. (e.g., taking the game with the appropriate seriousness, knowing what takes priority over winning and over playing, not faking injury or personal obligation to avoid losing; playing "hard" regardless of the score; not claiming that previous points didn't "count");

8. intuitively understand and respond to the "real-life" context in which the game is being played—i.e. the social, cultural, economic, political, and moral consequences of the result (e.g., whether someone's livelihood or self-esteem depends on the outcome).

**Going through the motions**

 Obviously, we are never merely playing a game. Or, to say it another way, we are never playing only one game. We are always conscious of the game's relation to the world in which we live, the world in which that game is one small part.
How much of this context could a non-human “understand?” Is a racehorse “playing the game” of horse racing or merely responding to the urgings of the jockey? Is Deep Blue “playing” chess or merely making moves on a chessboard according to a particular algorithm? Is either trying to win?

If not, they are not playing the game in any meaningful sense. As I see it, to perform the skills and behaviors associated with the game without consciously pursuing the object(s) of the game is not equivalent to playing the game. We might be practicing the game, pretending to play (as with pro wrestlers or actors in a movie about a sport), or exercising our muscles, but there is no game without the attempt, on the part of at least one of the players, to achieve the statable object of that game. (Could dolphins ever be taught to pursue such an object, or would they merely go through the motions of play? And how would we know?)

In addition, it is not possible to pursue the object of the game independent of the key prescriptions and proscriptions. Built into the object(s) of any game is the manner in which it/they must and must not be pursued.

The primary object of a football game, for example, is not to cross your opponents’ goal line while carrying a football; it is to score a touchdown. An equipment manager carrying a bag of footballs through the end zone of a football field has not scored a touchdown. These are profoundly different events, and perceiving the difference between them is a key to understanding the game. Thus, not understanding the difference between them is tantamount to not understanding the game of football. Could any non-human ever make this distinction?

“Time in”

Perhaps the single most important “rules” that are literally unstatable, then, are those that define the context of the game and answer the question, “When is the game being played?” None of us can say how we know that we are in fact playing a particular game (rather than, say, just practicing), but we generally have no trouble knowing that we are. That suggests that there are many subtle cues we give and receive about what play activity we are engaged in, what “counts,” when time is “in,” when the game has started, when play is suspended, and when the game has ended.

Let me offer a personal example. When my buddies and I play tennis, we meet each other at the court at a prearranged time, take out our tennis racquets and some balls, warm up for 15-20 minutes (hitting ground strokes, volleys, overheads, and serves), and eventually
someone asks, "Ready?" or perhaps "Ready to play?" If anyone says no, we continue to warm up. If everybody says Yes [or nobody says No], we toss away all but three balls. At this point, I [and presumably the others] understand that the actual game is going to begin with the next serve. There is never a formal announcement that play is about to begin. At most, the server will hold up a ball and the others will nod or wave.

None of us has ever acknowledged that this is our practice, none of us has stated any of these behaviors, as "rules," none of us would be able to say how we arrived at these customs, yet none of us, I assume, would have any doubt when the game has started.

Could I program a computer or teach a dolphin to operate with the same certainty? Could I specify all the variations in our ritual so that non-humans [or non-sports fans] could identify the boundary line between warm-up and play?

**On your mark... get set...**

Players, fans, and officials of any game or sport develop an acute awareness of the game's "frame" or context, but we would be hard pressed to explain in writing, even after careful thought, exactly what the signs are. After all, even an umpire's yelling of "Play Ball" is not the exact moment the game starts. [And think how confused a new fan of baseball would be when some dignitary threw out "the first pitch"!] We must rely on our intuition, based on our experience with a particular culture, to recognize when a game has begun.

We cannot, in other words, program a computer to understand all the conditions that must be satisfied for humans in a particular culture to say that a game is underway. If the computer is turned on and the software for that game booted up, the computer is, by necessity, playing the game, even if its "opponent" is a two-year-old, a monkey, or an accidental jiggling of the keyboard.

In addition, the computer will go on "playing" until it is turned off, even if its opponent moves on to other activities or drops dead. This phenomenon is the premise of the movie, *Wargames*, in which a supercomputer, WOPR, cannot distinguish between a "game" of Thermo-nuclear War and the real thing. When told it is involved in an actual battle, not a simulation, WOPR's reply is, "What's the difference?"

By contrast, a human being is constantly noticing if the conditions for playing the game are still being met, continuously monitoring the "frame," the circumstances surrounding play, to determine that the game is still in progress, always aware [if only unconsciously] that the other participants are acting as if the game is "on."
For example, in our tennis game, a player will occasionally say, after failing to return a serve, "I wasn't ready." If the others decide that the player is serious in that announcement, the point is usually replayed. How we determine whether or not the player is joking is beyond my understanding [although I'm perfectly capable of making such a determination] and certainly not in my power to express in words.

"Time out"
But there are other reasons, still more difficult to explain, why a particular serve in our game does not "count," i.e., is [usually] replayed. If the players on the receiving team decide that the server's concentration has been "unfairly" disrupted after serving a fault [because, for example, someone from another court has asked us to retrieve their ball or something else has caused "too much" time to elapse], they generally tell the server to "take two," that is, to try his/her first serve again. In effect, they have made a ruling that the server has been inappropriately distracted between the first and second serve and "deserves" a second chance at two serves for that point.

But what exactly is an "unfair" disruption of play according to the etiquette of our game? Can any one of us spell out precisely what situations warrant a second chance and which do not? After all, we are making no effort here to follow the practices of some official tennis game, so we have no rulebook to appeal to, even if we wished to. [Actually, I would feel silly consulting one for such a petty matter.]

I assume that we are all just following a tradition of hackers' tennis that has been passed down over the generations, almost always by imitation rather than by any explicit explanation.

I also assume that our behavior is based on our own notions of "fairness," not on something we could explain in detail.

As a result, I'm not even certain that the other players in my game have the same reasons for telling someone to "take two" as I do, but I have noticed a reasonable consistency over the years.

Occasionally, we facetiously [I assume] debate about whether we should give the opposing player another first serve, but our discussion itself is usually seen as a sufficient distraction to settle the matter in the server's favor. Incidentally, I have never heard the server request a second chance, except in jest [I have assumed], regardless of the circumstances, and some servers will not accept the receiving team's ruling unless it is insisted upon.
Below the surface: Who's the best sport?
A kind of sub-game is going on "underneath" the more obvious one called tennis. Many hackers, myself included, try to one-up each other in politeness and thoughtfulness, so this aspect of our tennis matches can be thought of as a kind of game-within-the-game in which the object is to come off as the best sport.

Of course, no one ever acknowledges this game and no winner is ever announced. My guess is that this practice gives us hackers a chance to feel successful on some level, regardless of the outcome of the match.

Keep in mind that I have never discussed any of these customs with my tennis buddies and probably never will, but I can say that almost every hacker I've ever played tennis with (including those who are fierce competitors and those who are impolite and inconsiderate in other ways) has practiced this non-professional courtesy, and I'm confident that if I played in a friendly game in Oklahoma or Maine or Florida or Arizona, I would see this same tradition being followed.

Yet what chance does a computer, a dolphin, a non-native speaker, or even a non-player have of understanding this game of "Who's the best sport?" It's the kind of thing you have to learn from experience, observation, and inference, not from a set of statable rules.

How can you tell?
Distinguishing between counting and not counting, between "time in" and "time out," is probably the single most basic skill a game player, fan, or official must possess. Without it, a participant or observer could not tell the difference between the preliminaries (such as a warm-up), the breaks in the action (such as a time-out), the aftermath (such as a handshake or a victory lap) and the game itself, could not know when to expend energy and when to relax, could not keep score accurately, could not determine what behavior was affecting the outcome, and so on.

Obviously, we learn to make these distinctions, but we learn them without being aware, for the most part, that we are learning anything. As a result, the process by which we decide that a game is being played is generally hidden from us and therefore seems perfectly natural, not something that has to be learned.

We forget that children, people from other cultures, and adults in our own culture who are unfamiliar with the game cannot automatically tell which actions are part of the game and which are not.
But even if someone understands the notions of play (#1 in our list above), recognizes when a particular game/sport is being played (#2) and is familiar with its object and “official” (written) rules (#3 and #4), such a person would have difficulty participating in the game/sport at any level without a great deal of additional information (or “rules”) about the activity.

The outsider
To illustrate this notion, let us imagine a person named Leslie who has taken extensive tennis lessons, memorized an official USTA rule book, and watched professional tennis on television but never actually played a match at any level and never played or watched or read about any other games (which presumably share some of the unstated rules of tennis).

One day, let’s suppose further, someone invites Leslie to substitute in one of our doubles games. Even assuming his skills were similar to ours, I would venture to say that Leslie would not have much fun and would make the rest of us very unhappy. He would almost certainly get very confused and frustrated at the way my friends and I play “tennis.”

In fact, Leslie might not even recognize it as tennis at all and might conclude that we are playing some bastardized form of the game.

And in a sense, he would be absolutely right.

By the book
For one thing, as Leslie would be dismayed to discover, none of our rules are “official,” in the sense that they are written down or formally agreed upon.

We all seem to assume that we are following the most important rules of professional tennis, except where that is not possible. So, for example, when the ATP adopted a tiebreaker rule for deciding a set, most (but not all) of the games I was involved with also adopted that practice.

In general, the only rules we discuss are those we are uncertain about, such as whether it is legal to touch the net during a point or hit the ball before it crosses the net. Otherwise, we have never spelled out the “rules” we are using, have never stated which set of “official” laws we will abide by, have never established an authority to settle disputes, and have never ever consulted a rule book (at least not at the court) to determine the “correct” way to play. When we disagree about the rules, which rarely happens, we use our knowledge of pro tennis to defend our position.
Not by the book

But we certainly don’t do everything as they do on the ATP tour. As I have already indicated, we give people a second chance at a first serve according to our own lights, not what we see happening at Wimbledon.

To save money, we do not open a new can of balls every seven games, and when we play indoors (where we have to pay for court time), we switch ends of the court after each set, not after every odd game.

In addition, we never assess penalty points for swearing, racquet abuse, exceeding time limits, or foot-faulting. We might grumble about these violations, especially if we think a player is getting an unfair advantage, but we tolerate them, apparently because we perceive them as too trivial to worry about.

Yet some of the people I play with are fanatical about the height of the net. They use a tape measure to make sure the middle of the net is exactly 36 inches high and raise or lower it as needed. They even bring “doubles sticks” to raise the net to the appropriate height at the sides. Wouldn’t our “inconsistency” drive Leslie crazy?

Obviously, one of the most crucial [and rarely stated] meta-rules of games that someone like Leslie (or a computer or a dolphin) would not understand is that we can play them any way we wish, as long as we have (apparent) agreement among the participants. If we want to play tennis with a racquetball or without a net, what’s to stop us?

Tradition-bound

And yet, in my experience, few people choose to play games or sports in innovative ways. Although they are willing to eliminate “trivial” or inessential rules, most people evidently want to feel connected to the tradition of “real” games (i.e., professional sports), even when the rules of the pro version are inappropriate for the local circumstances.

So, for instance, almost all junior high school basketball hoops are 10 feet high, just as they are for the Chicago Bulls, even though the kids are two or three feet shorter than players in the NBA. I guess we like to create the illusion for ourselves that these youngsters are playing the same game as Michael Jordan.

House rules

Even if Leslie finally figured out exactly how our “rules” differed from the ATP’s, he would undoubtedly still be very uncomfortable in our doubles game. For one thing, we play a relatively “casual” game.
We often talk to each other between points, jokingly insult one another, compliment a particularly good shot, ask what the score is, predict what is going to happen next, and so on. Between games, we might exchange personal information or tell jokes.

None of this, of course, happens in professional level tennis, at least not the matches shown on television.

My guess is that Leslie would be disconcerted by our apparent lack of decorum. He would probably perceive us as being remarkably uninterested in the outcome of the game, when in fact we play to win almost as "seriously" as the pros. If he was used to silence between points and games, his concentration might be seriously upset.

**Banter protocols**

Perhaps he would eventually be able to shrug off our casualness as a trivial idiosyncrasy that doesn’t affect the game in any significant way, but it is doubtful that he would be able to participate in the banter. In that case, our “rules” would accommodate his silence. No one is required by our etiquette to talk if s/he doesn’t want to, although we (at least I) tend to prefer those with “personality.” The game is just not as much fun (for me) with duds or robots.

If Leslie did start to talk, though, he might find himself violating other aspects of our etiquette. Certain subjects are taboo, or at least frowned upon or rarely mentioned. Business, for example, is almost never discussed between points and rarely between games. (Perhaps this is merely because the people I play with don’t share work experience.)

More significantly, politics and religion are strictly avoided. At most, someone will make a passing comment about the president or some interesting current event, but I can’t remember a single remark about abortion or gun control or any other such controversial topic, even when I have played with other academics. It’s as if we do not want to acknowledge that we might have serious disagreements outside the tennis court.

Would Leslie recognize that we are limiting our comments to certain topics? Until I wrote these last sentences, I had never articulated this “rule” even to myself (though I’ve been playing for over 40 years).

**Our own language**

Leslie would almost certainly have more difficulty getting used to our line-calling practices. Since we don’t have officials, we (like most hackers, I assume) have devised a fairly elaborate system for deciding if a ball is in or out.
Keep in mind that we have never discussed this system, never written it down, never spelled it out in any way, yet our entire game depends on each player’s following a fairly rigid, if unstatable, set of behaviors. (I’m willing to bet that is generally the case with most amateurs, including those in tournaments, which rarely have official line-callers.)

First, we sometimes use hand signals to indicate “in” (a palm down) or “out” (a finger point). and sometimes, when we think the call is obvious, we say nothing at all. As far as I can tell, we use hand signals only when the ball is not returnable and say “out” when a player has hit the ball back and we wish to indicate that the point is over.

Second, we have a set of “rules” governing which player makes which call. Generally, players on the team about to hit the ball are expected to call the lines, even if a player from the opposing team is closer to the ball when it hits near the line. For example, on a serve, the partner of the player receiving the ball is supposed to announce an out ball.

Of course, there are exceptions (which I can only hint at). Sometimes, for example, the player that hit the ball (or his/her partner) has an unobstructed view of the situation and makes the call. Sometimes, more than one player makes the call. Occasionally two players disagree and a discussion ensues.

To settle a disputed line call, some players like to look for the impression (called a “spot”) the ball has left on the playing surface. If they cannot find a spot, they generally assume the ball hit the line (and the point is awarded to the hitter).

**Fuzzy boundaries**

For the most part, in keeping with the game of “Who’s the best sport?”, players try to appear calm, rational, polite, and objective about line-calling, but occasionally someone will get upset over another’s call, and a new game, whose rules are even harder to describe, breaks out. In this game (“I’m Right and You’re Wrong”), the object is to get the other player to back down and agree with your perception.

What players under these circumstances are allowed or not allowed to say depends partly on the social rules that are in operation—the power relations among the players off the court—so once again we see the fuzziness of the boundary between game and non-game.

In most cases, the desire to continue play or to win the sportsmanship game ends an argument fairly quickly [but I remember once when a player and his grandson argued for over 15 minutes about a particular line call]. Usually, when an impasse is reached, players will agree to take the point over.
As should be clear by now, I would never get all our practices down on paper, no matter how long I stayed at it. In fact, I haven’t even finished explaining our system for calling lines, or the “rules” related to the length of time it’s appropriate to debate a particular line call.

In addition, in my attempt to codify our game for “outsiders” (those who have never seen us, or other hackers, play). I have found myself distorting the reality for the sake of convenience. In many cases, I ignored what I knew to be clear exceptions to avoid getting bogged down in impossibly complicated nuances that I’m only dimly aware of.

For instance, one friend, John, and I always discussed controversial issues when we played singles but never when we played doubles! I also ignored the fact that the various groups I play tennis with do not play by identical rules (e.g., normally we spin a racket to determine which team serves first, but when we play at Nazim’s house, the player who opens a can of balls serves the first game); only hinted at the effect a change in circumstances (outdoor vs. indoor, free vs. fee) can have on our game; and oversimplified the modifications in our game over the years.

Thus, as I’ve tried to show, the “casual” game of tennis that my buddies and I play is really based on an enormously complex set of “rules”—assumptions, traditions, and conventions—that govern our behavior on the court (whether we are consciously aware of it or not).

My contention is that no one could ever “fully” describe those rules or those governing the players of any other game.

The infinite-regress trap
It is time to see exactly why a complete listing of a game’s rules is impossible. There are several reasons:

1. Game rules, like any rules, must be stated in some language, and all language is subject to interpretation. But the rules for interpreting any language would also have to be stated in some language, and these rules would likewise have to be interpreted. We are trapped in an infinite regress. Thus, the question “What are the rules?” can never be answered fully.

2. Each individual player could have his or her own personal conception of a game which would differ (if only slightly) from all other players’ versions, and each player’s understanding of that game’s rules could change over time. No finite list of rules could include an infinite number of possible variations.
3. Since any two players could be playing the same game with different interpretations, there would have to be a set of meta-rules for reconciling these differences when they surface.

Of course, these meta-rules are, in effect, the rules to another game and are therefore subject to the same interpretive variations as the rules of any other game. Again, we run into an infinite regression. There is no bottom line, no point when we can accurately say, "These are the ultimate meta-rules for settling disputes."

Thus, the questions, "How do we settle disputes about the rules themselves, about whether a player has violated a rule, and about the appropriate penalties for a rule violation?" can never have a final answer.

4. Even if two players agree on certain rules and how to interpret them, disputes about what actually occurred (such as whether a ball landed on the back line or just beyond it) can still arise, and the players will need to abide by meta-rules in settling these disputes as well. These meta-rules, like those in #3 above, are also part of an infinite regression, so the question "How do we settle disputes about what really happened?" has no ultimate resolution either.

5. Since there are various "levels" of rules, "higher" rules (such as a real-world crisis) might have to take precedence over "lower" rules (such as time constraints); there must be a set of meta-rules for determining when this is appropriate. As with the other meta-rules we've looked at, there is no "final" set for ending disputes, so the question, "When is it appropriate to suspend certain rules?" cannot be given a full answer.

6. Since all games begin and end and may be interrupted by "outside" events (such as a TV ad), we must have a set of meta-rules for determining when the constraints apply and when they don't. Again, these meta-rules are susceptible to interpretation and dispute, leading to yet another unendable regression.

"Simons" often take advantage of this fact by tricking players into thinking play hasn't begun and then saying something like, "Before we start, say hi to your neighbor. Ah, I didn't say 'Simon says.'" Therefore, the question, "When do the rules apply?" cannot be fully answered.
We can see now why it is impossible to spell out a complete set of rules for any game. Now we need to ask why we have no trouble playing a wide variety of games.

**If we can't know all the rules, how can we play any game at all?**

Is it because participants rarely have to deal with "meta-rules" and so the infinite-regress problem almost never comes up?

To me, this is not a plausible explanation. There are simply too many occasions we can name—in virtually every game ever played—in which meta-rule questions arise. When a player accidentally rolls the dice off the table, argues a call, gives (or refuses to give) an opponent a handicap, calls for a do-over, takes a mulligan, asks for a director's ruling, warns an opponent about an unwise move, or encourages the other team to play faster, the players are facing situations that are not (and could not be) completely covered in the recorded rules. Meta-rules (and even meta-meta-rules) are an integral part of all rule-governed activities.

Is it because players don't take games seriously so it doesn't matter that they can't know all the rules?

Again, this doesn't work for me because it is clearly not true in all cases. Obviously, some players (myself included) care deeply about the game and the outcome. Many of us are playing for high stakes—money, prestige, a trophy, pride, self-esteem, ego satisfaction, a feeling of control, etc. In fact, it's probably pretty rare for players to have no emotional involvement in the game they are playing. After all, why play unless the results "matter" in some important way?

My guess is that almost all players almost all of the time take almost all games very "seriously."

Is it because players mistakenly believe that there is a "bottom line," that the rules are clear, complete, and "final," and that somebody somewhere knows all of them?
This is getting closer to sounding right, but is still a half-truth at best. Having the misconception that a game's rules are solid and statable can provide a player with a sense of confidence in the "reality" of a game, but my realization that no one can know (let alone state) the rules of our doubles game has not dampened my enthusiasm for tennis one iota. In fact, my recognition that games, like languages, can exist only because of an unspoken, almost mystical, agreement among the participants actually enhances my appreciation of them.

Although my attitude may be idiosyncratic, I seriously doubt that anyone else's enjoyment of a game (or willingness or ability to play it) would be diminished by realizing that we can't list all its rules.

"It's only a game"
I believe we can go on playing games wholeheartedly even when we are aware of the incompleteness of their rules. Why? Because, on a gut level, we cannot distinguish between something fanciful—like a movie or a joke or a dream or a game—and something "real."

Games feel like any life-event, so we can be immersed in them even though we may know intellectually that they are artificial constructions. Therefore, it makes no difference to us (emotionally) that a list of rules governing them cannot be completed, just as we can be profoundly affected by a joke or piece of fiction or nightmare that is not logical, realistic, or "complete."

We can suspend disbelief and rationality (even when some part of our brain is telling us it's only a story or it's only a dream) and respond deeply to creations of the imagination—our own or others'.

We can do this because we have the wonderful (and perhaps unique) capacity to operate on the "as if" level; we can play a game as if we know all its rules, as if there is an ultimate set of meta-rules, as if all potential disputes can be settled. We can imagine a game in the abstract and in a vacuum and can project that Platonic ideal onto the one that must be played in the world of social and political reality.

In other words, we can operate on (at least) two distinct levels of cognition at once. We can play any game as if it had an autonomous existence, even though we know perfectly well that the players create the game each time they agree to play and that any player at any time can destroy the game by quitting, by arguing, by stalling, or by any number of other spoilsport tactics.
Similarly, we can play any game as if it is important (and genuinely feel that it is), even though we know that it is not very high on our list of life priorities. We can play any game as if it transcended our culture, even though we recognize that players can have “unfair” (dis)advantages as a result of their upbringing. We can play any game as if it transcended morality (so we might intentionally and unashamedly foul or fool an opponent) even though we know that players can cheat or violate the rules in inappropriate ways.

**Suspension of disbelief**
Without this ability to operate in the conditional universe of “Suppose...” and “What if ...,” game playing would be impossible, as would drama and fiction and, I suspect, language itself. We must be able to behave as if a game were not “merely” play, even though we are fully aware it is nothing else.

Like an actor, we must be able to take on a role but never give up our sense of self. We must be “in” the game to enjoy it but never so far in that we forget who we are. It is a delicate balance fraught with danger, which is perhaps why so many people (especially adults) shy away from games.

**Non-human game players?**
It is also, I believe, one more reason that computers (at least as they are today) will never play a game in the same sense that humans do. Computers have no conditional, no ability to create temporary self-delusions, no play mode, no sense of “as if.” To a computer (we must assume), a chess move is just another calculation, no different from finding the square root of pi.

To a human, a chess move is (usually) part of a carefully designed pretense, a system of orchestrated assumptions, an artificial structure that can bring stimulation, competition, camaraderie, fun, and a variety of other good feelings. In general, the chess-playing human voluntarily accepts a particular challenge that involves a specific goal and specific constraints and which s/he can abandon at any time. The chess-playing computer, on the other hand, does not choose to start and cannot stop on its own. The human is aware of the voluntary and “non-serious,” conditional nature of the activity, but the machine is not (and probably can never be).

What about animals? Does any non-human creature have the ability to suppose, to imagine something that doesn’t exist except as an agreement among participants? If not, they
will never play a game as we do. They will either take it too seriously or not seriously enough and, therefore, like any spoilsport, undermine the enjoyment of the game for any human participants or observers (as was the case with the water-polo-playing dolphins).

But even if animals [or computers] could think in the conditional, they still might not be able to play games as we do. They would also have to be able to trust other players to function in basically the same way. To play a game [or use a system] meaningfully without knowing all the rules requires the faith that others understand the game/system as you do or at least will behave in ways that seem consistent with such an understanding. Without that faith, a player would inevitably end up being the spoilsport.

**Meta-rules in other arenas**

By way of analogy, consider our [or any other] monetary system. Most people recognize that the currency we use has no inherent worth and that it gains its value from mutual [if tacit] agreement among its users, which means its value is subjective, symbolic, and subject to change.

Few people believe that there is an objective, stable method for determining how much milk a dollar should buy. Most of us understand that there are no "rules" or meta-rules we can refer to that would settle a dispute about the value of a dollar bill and that its purchasing power is dependent on consensus, on other people’s willingness to give us this much milk for this many dollars. And yet we can still use the coin of the realm and, for the most part, get our money’s worth [by our own standards].

The system works even though no one can explain it fully and even though we all know it could collapse at any moment if people stopped trusting each other or the system itself.

The same is true with another currency—language. Even though words have no inherent meaning and no one has been able to list all the rules governing the construction of sentences, we can still communicate reasonably effectively for most purposes.

We all know that anyone at any time can choose to destroy the process by acting on Humpty Dumpty’s premise that words can mean whatever we want them to mean. We know that there is no rulebook, no authority, no indisputable arbiter we can appeal to in such a case [since they would all have to use more words to settle the dispute].

Like any game, communication is dependent on the participants’ willingness to operate as if there were universal agreement about meanings and grammatical rules.
We need to remember, though, that games are not analogous to these two currencies in at least one crucial way. Both money and language, after all, serve obvious, vital functions in the world, whereas the value of games is not nearly as apparent. We can easily understand why people would almost always try to go along with a monetary or linguistic system, since they believe that both can benefit them and the community significantly. In addition, most people recognize that destroying either system could ultimately threaten their own well-being.

**Rule-preserving meta-rules**

But games? The common perception is that no one gets hurt if a game is spoiled. So why would anyone continue to submit to an arbitrary (and incomplete) set of rules that was causing him or her to lose face, patience, and/or money? Why do people continue to play “by the rules” when they are losing the game?

Since losing is undesirable, we need to explain why so few players take advantage of the fact that the rules are incomplete and therefore infinitely challengeable. We need to understand why people almost always play as if the rules were not only complete but knowable and statable, and rarely allow themselves to play the meta-game of arguing about the rules and the meta-rules, ad infinitum.

One possible answer, of course, is that players don’t realize that this “strategy” exists, but I think that all of us have witnessed many examples of the kind of behavior I’m talking about. Almost everyone has seen images of managers and players, nose to nose with an umpire, arguing a call or an interpretation of the rules, and even non-sports fans have probably seen TV ads based on John McEnroe’s antics on the court, so I have to assume that virtually everyone realizes that this option is theoretically available to any player.

So what are the real “meta-rules” that keep most of us from playing this particular meta-game? Here are a few of them:

1. A game is supposed to be for fun, and, playing the game itself is more fun than playing the meta-game of arguing. Except for young boys in the front yards of America (who will argue endlessly about a single play), most players have learned that the meta-game is boring, repetitive, and fruitless, often ending in a stand-off;

2. A game is supposed to test certain skills, and these do not usually include the skills of debate, sophistry, and intimidation tested by the meta-game;
3. A game is supposed to be for camaraderie, and arguing about the rules leads to antagonism rather than a spirit of friendly competition;
4. Players are supposed to be good sports (whatever that is), and rule challengers are perceived as poor sports or even spoilsports;
5. The "ideal" game, the game we all want to play, works fine as it is and does not include a discussion of rules or meta-rules;
6. A set of rules that has been tested is better than one that has not, so if it's not broken, don't fix it;
7. Doing things as others have done them in the past allows us to feel connected to our ancestors, our culture, and our traditions;
8. Following the rules that others follow allows us to compare ourselves to a wide spectrum of players, not just our immediate opponent[s];
9. Challenging long-standing traditions is inherently unwise because it creates the impression that nothing is sacred and could, if carried far enough, lead to anarchy.

For all these reasons, a player who argues about rules risks disapproval, sanctions, and even ostracism, so the vast majority of us choose to "leave well enough alone." Most people avoid and frown on the meta-game of arguing with rules and meta-rules because, without necessarily being aware of their reasons, they perceive it as a threat to pleasure, continuity, and stability. Thus, most games continue to be played "as they always have been." For the same reasons, many people are suspicious of new games.

To return to our central question, then, we can play a game even though we can't know all its rules because, for a variety of reasons, we tacitly conspire with our fellow players to act as if we know them all.

**The big picture**
In this way, games are no different from every system we use. In an important sense, all rule-governed systems—including law, politics, war, morality, education, economics, and language—are games, as many people have noted. Therefore, virtually all of the lessons we learn from "non-serious" games are directly transferable to the "real" world. What are those lessons? What follows from the acknowledgment that no human system has a completable set of "rules?" Let us spell out some of the implications.
1. Power and authority are arbitrary, not inevitable, depend on consensus [or at least acquiescence], and have no "divine" right to exist.

2. Rules for any system are not handed down from above, can exist only through the agreement of the participants, are always open to negotiation among the "players," and are continually evolving. As Robert McConville reminds us, if a game survives, "the rules for playing the game are constantly being changed as they are passed from tribe to tribe and generation to generation" [The History of Board Games, p. 8].

3. The most powerful rules, the ones least likely to be violated, are those that are not stated explicitly, those that people have to infer or intuit. To state a rule is to invite players to break it, but to leave a rule unstated is to make its violation almost literally "unthinkable."

4. We cannot accurately predict how any rule, stated or unstated, will be interpreted or enforced, so no rule, simply by its existence, will necessarily produce or prevent a desired behavior.

5. We cannot accurately predict or control what customs, norms, conventions, traditions, or expectations will evolve for a particular game or system of rules.

6. No set of rules is inherently superior to any other. In order to judge a set of rules, we must employ a set of meta-rules, which themselves would have to be judged by a set of meta-meta-rules, and so on ad infinitum.

7. An infinite number of sets of rules will "work," will allow us, individually or collectively, to function successfully (or at least to our own satisfaction).

8. The longer a system is followed and the more people who attempt to follow it, the more complex the recorded rules will become, and the more sets of meta-rules and meta-meta-rules, etc., will be recorded. Consider any legal system, religion, or professional sport as prime examples.

9. Every person operates according to an unlimited number of sets of rules, so it is almost inevitable that some of these sets (such as religion and business) will come in conflict with each other, which means that every person is also operating according to an unlimited number of sets of meta-rules for reconciling such conflicts, and an unlimited number of sets of meta-meta-rules and so on.
10. As humans, we have little choice but to act as though some of these sets of rules were absolute and indisputable. Otherwise, we would be trapped in an infinite regression and utterly unable to make meaningful choices.

11. Paradoxically, we cannot live according to any set of rules (because we can never know them all and because they will inevitably conflict with other sets we are trying to live by), so in order to continue to perceive ourselves as faithfully following a “complete” set of rules, we must learn to rationalize our deviations from it (or feel a great deal of guilt).

12. It is reasonable to say we are playing a game/living by a system even though we are not following all its rules. For this reason, following some of the rules in a system creates the expectation [in ourselves and others] that we will follow all the rules, including the unstated and the unstatable ones.

13. No one can tell for sure if someone [including oneself] is “really” playing a game/living by a system because it is not possible for anyone to follow all the rules in a game or system. Therefore, we can pretend to be playing any game/living by any system without others being able to detect that we are pretending. We can also pretend to be pretending and so on, and no one will be able to tell the difference.

14. No two people can possibly follow the same set of rules in exactly the same way.

Obviously, the recognition that we cannot know all the rules in a system can have a profound effect on how we approach the world. It can make us want to curl up in a corner with our thumb in our mouth or to go out and make sweeping changes in our most important institutions. It can destroy us or free us, depending on how we feel about a world in which there are no absolutes, no bottom lines, no final list of rules, a world in which all systems are “equal” and all meaning relational. Some [including myself] are comfortable with, even invigorated by, this notion, but others [perhaps a large majority] are enormously disturbed by it.

**Today Parcheesi, tomorrow the world**

Of course, there is nothing new about the relativist claim, but, to my knowledge, no one has applied the concept to games, those obviously artificial constructs. The argument has raged about more “important” human systems, like law and religion and language, so emotions, desires, and values always tend to cloud the issues. People understandably want to believe
that their beloved institutions are sacred, unchanging, and right, but [almost] no one feels that way about games.

So I have chosen to examine the reality of rules and meta-rules in this non-volatile, "safe" context of games, hoping I would not scare away those who tend to shun a relativistic argument. My goal has been to show convincingly that we cannot know all the rules but we can still play the game, so that I could suggest, through analogy, that

We can go on using [and revering] any system even if we acknowledge that it is as artificial, arbitrary, challengeable, and "incomplete" as any game.

Any system, no matter how long it has been around and no matter how complex its list of rules and meta-rules, is viable only as long as there are individuals who support it.

Conclusions
If my efforts have been successful, if people take away valuable lessons about "life" from this analysis of games, it will demonstrate, ironically, that games can indeed serve at least one vital social function: as abstractions of "real-world" situations, they can provide an analog to other, more "important" and more complicated, aspects of life and thus can help us see what otherwise might be invisible. If for no other reason, games should not be dismissed as trivial forms of entertainment. If we remember to use them wisely, they could be a profoundly important aspect of our culture. As the young would say, GAMES RULE!
The Incompleat Gamester

RULES OK
OR: HOYLE ON TROUBLED WATERS

by David Parlett

A paper presented at the 8th annual colloquium of the Board Game Studies Association, Oxford, 2005

What are the rules of a game? Ask almost anyone and they'll probably mention at least one of the following:

1. They're what's printed on the rule-sheet of a published game - or, in the case of a traditional game, in a book said to be written by some character called Hoyle. Either way, they're essentially some sort of written description of how the game goes.
2. They're the "official" rules which you must follow if you don't want to be thrown out of the club. They are essentially prescriptive and proscriptive (they tell you what you must and must not do).
3. They're instructions designed to teach the uninitiated how to play the game.

Already the concept of rules starts to cover quite a lot of ground. They may be descriptive, prescriptive, proscriptive, or instructive. But they can be more than that. For instance:

4. There are rules of appropriate behaviour, like not starting to pick your cards up before they've all been dealt. These are sometimes called the Proprieties, or Etiquette.
5. There are rules of sanction and correction, which only operate when players contravene the basic rules of play. These are often known as the Laws.
6. Then there are the rules (so called) of strategy. These, indeed, are the only rules covered by Hoyle himself in his earliest book, A Treatise on the Game of Whist (1742), which offers "some Rules whereby a Beginner may, with due attention to them, attain to the playing it well...".
7. Consider also games that require or at least invite you to play a part. In Chess, you are a commander in charge of an army; in the Chinese Game of Promotions, you are a prospective Mandarin; in Monopoly, you are a property developer and business tycoon. If these are rules at all, they may be designated dramatic or liturgical. You may decline to call them rules, yet they are a valid part of the
meaningful experience of playing the game and can't be entirely omitted from any comprehensive account of it.

So let's start again and try imposing some structure on formulating an answer to the question "What are the rules of a game?"

## Explicit rules

It is widely assumed that all games have official rules that are recorded in writing. But it is mistaken. For one thing, most games are not book games but folk games, being transmitted by word of mouth, example, and practice. For another, even where written rules do exist, probably no folk games and certainly very few book games can lay claim to a widely recognised governing body responsible for authorising them.

Nevertheless, all games must have rules of some sort, otherwise they cease to be formal entities and become merely undefined periods of unstructured play. The most basic rules of a game are not a form of words but a set of operational procedures you apply to the gaming equipment in order to play the game. Following Salen and Zimmerman, I refer to these as the **operational** rules. Operational rules are what you apply to the hardware of gaming equipment to produce an instance of play. I will put this into diagrammatic form as the basis of a model of a game that I intend to build up during the course of this paper:

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Operational rules (software) > Equipment (hardware) > Play (application)
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Operational rules are **explicit**, in the sense that they can be verbalised, even if not necessarily recorded in writing. The realisation or embodiment of the rules in a physical set of gaming equipment may be likened to the hardware of the game, or, by another analogy, to its skeleton. When we unearth the remains of a game in an ancient tomb, we find only the skeleton: we cannot know (or be sure we know) how the game was actually played. The application of the rules to the equipment is what produces the actual play of the game. A game must be played to be fulfilled, or to have meaning. Every time you play a game you are breathing life into its clay in accordance with its operational rules, and it becomes what Salen and Zimmerman describe as a "meaningful experience of
play".

The most basic level of experience suggests that the rules of a game are something inherent in the game itself - or, more accurately (since a game is essentially a mode of behaviour), an abstraction existing in the minds of all its players. They are expressed in words every time someone describes a game or explains how to play it. Not everyone will have exactly the same understanding or grasp of the game, so they're unlikely to transmit their knowledge in exactly the same form of words. These rules are therefore not a known quantity but an average of all the understandings of all the players. As such, they may contain inconsistencies. The totality of rules of all but the simplest games are not exactly a cloud of unknowing, but could be described as a cloud of fuzzy knowing. In telling you how the game is played, they serve to establish its formal identity. Huizinga, in Homo Ludens, says "Every game has its rules"; but I would go further and say "Every game is its rules, for they are what define it".

For example, Noughts & Crosses (Tic-Tac-Toe) is defined in the Oxford English Dictionary as:

> a children's game with a figure containing nine spaces [in three rows of three], which are filled up by two players alternately with ciphers and crosses, the object of each being to place three of one kind in a line.

This definition clearly expresses the rules of Noughts and Crosses, but it is equally clearly a description rather than a prescription. It says nothing about authority or obligations but merely asserts the identity of the game. It relates the name of the game to a set of procedures, and a set of procedures to the name of the game. It doesn't say you have to play it this way. All it says, in effect, is that, if you play a game that follows this set of procedures, then the game you are playing is Noughts & Crosses; otherwise it isn't.

Cosimo Cardellicchio has likened the abstract body of operational rules to a virus inhabiting the mental software of the gaming community (by which term I mean all the players of a given game). He also pointed out that, like any other virus, it is prone to mutation, thus causing variations and evolution of one game to another. Variable comprehension and faulty transmission are two ways in which rules change and so cause games to evolve.
Implicit rules

The operational rules of a game are known consciously, and are made explicit whenever they are addressed and verbalised. But there are also at least two types of rules that are unconsciously known or implicit. I'll call these respectively (a) foundational rules and (b) behavioural rules, and add them to the model as follows:

Foundational rules > operational rules < behavioural rules

| equipment
| play

Foundational rules

As Salen and Zimmerman observe, the operational rules of Snakes & Ladders include rolling dice, moving counters towards a goal 100 squares distant, and taking short cuts backwards or forwards when landing on a snake or a ladder respectively. But you could play essentially the same game by any means of randomising a number from one to six, adding it mentally to a running total, and automatically reducing or increasing your total when it reaches a certain predetermined level, the winner being the first person to total 100 exactly. They describe these as the deep, underlying mathematical rules shorn of any reference to a board, dice, counters, or snakes, ladders, and everything else that turns the game into a meaningful experience of play. Salen and Zimmerman call these the constitutive rules; but no such word appears in the Oxford English Dictionary, and I think a more sensible term is foundational rules.

Behavioural rules

Not all the rules of a game are expressible in words. Salen and Zimmerman refer to certain rules of behaviour as the "Unwritten Rules", this being th title of a substantial essay by Steven Sniderman. Sniderman also uses Noughts and Crosses to introduce the concept of unwritten rules of behaviour:
Is there a time limit between moves? Normally, we both "understand" that there is, and we both "know" that our moves should be made within a "reasonable" time, say 20 seconds. If one of us takes longer, the other starts to fidget or act bored, may even make not-so-subtle comments, and eventually threaten to quit. Without having stated it, we have accepted a tacit time limit [...] Is it a rule, or isn't it? Suppose it is my turn and, no matter what I do, you will win on your next move. Couldn't I prevent that from happening, within the rules stated, by simply refusing to play? Nothing in the rules forces me to move within a particular amount of time, so I simply do not make my next move. Haven't I followed the rules and avoided losing? And yet, if you've ever played a game, you know that this strategy is almost never employed and would be completely unacceptable. Anybody who seriously resorted to such a tactic would be [ostracized] in the future. This behavior seems to violate some fundamental but rarely stated principle of the game without any of us ever having to discuss it.

Sniderman also discusses implicit rules about whether verbal banter is acceptable, and, ranging even more widely, observes:

Since there are various "levels" of rules, "higher" rules (such as a real-world crisis) might have to take precedence over "lower" rules (such as time constraints), there must be a set of meta-rules for determining when this is appropriate. As with the other meta-rules we've looked at, there is no "final" set for ending disputes, so the question, "When is it appropriate to suspend certain rules?" cannot be given a full answer.

Not all behavioural rules are implicit, however. The more widely and seriously a game is played, the more explicit do rules of behaviour become. In the International Laws of Contract Bridge, for example, they are referred to, reasonably enough, as the Proprieties and are made quite explicit.

The written rules

Now let's consider the written rules, by which I mean any set of rules that has been formulated and recorded in writing. I asserted above that most of the world's games, especially taking variations into account, are not recorded in writing. Is this because the vast majority of the world's population is illiterate? No. When I looked into this question I was surprised to learn that nearly 80 per cent of the global population aged 15 and over is officially literate, and that the figure is expected to rise to 85 per cent by 2015. So am I wrong in my assertion about folk games and book games, or is something else going on here? I think the latter.

It must be true that some countries are more or less literate than others. But
even a largely literate population, such as that of Britain or the United States, may include a large number broadly describable as non-literate for one reason or another. For example:

- A significant proportion will be children, who may be described as pre-literate. They play games, of course, but children's games are essentially folk games rather than book games.
- Some people will be, to all intents and purposes, functionally illiterate. But it is patently obvious that being illiterate is no bar to learning and playing games.
- Probably a larger number are nowadays described as aliterate - that is, they can read and write, but avoid doing so whenever possible. So they too will pick their games up in the traditional non-literate way.
- If we describe children as pre-literate, I suppose we can also invent a category for the post-literate - that is, people whose literacy has become compromised by age or failing eyesight.

I don't know what proportion of the remaining truly literate society remains after deducting the various types of non-literates. But even if it is over 50 per cent there still remains the cultural fact that following the written rules of a game demands a peculiar degree of concentration and interest that many people would prefer to avoid if they can. The plain fact of the matter is that learning games is, by long tradition, of itself not a literate activity. After all, games-playing is a form of cultural behaviour, and people learn most of their behaviour from other people, not from books. Players are only likely to call on books and printed rule-sheets when they are passionately concerned with what they like to call the "official" rules - that is, those authorised as prescriptive and proscriptive. One consequence of this tradition is the fact that book games tend to remain relatively static over long periods of time, and are less likely to vary and evolve than most folk games.

An inevitable consequence of verbal transmission is the growth of variation in the operational rules of play. Each ad hoc exposition of the rules is unique to the person explaining the game. Variation can occur because the learner may not fully understand the rules, perhaps because certain situations that occur but rarely are not mentioned by the teacher, and the newer player will have to find some way of dealing with them when they do occur by inventing rules to cover them. In course of time, rules transmitted verbally undergo changes like those encouraged in the game of Chinese Whispers. Book rules, on the other hand, tend to retain an element of fixity. Indeed, a notorious feature of the transmission of book rules is that they often remain transmitted in a form that no longer corresponds to the way a game is actually played in real life. A classic...
example is that of Brag, the English equivalent of Poker. The form of the game described in Hoyles up to the mid 1970s was one that seems to have died out by the 1790s.

A template for written rules

Who are the rule-writers, and how should they do it? Obvious candidates include games inventors, the authors of Hoyle-type gaming manuals and anthologies, and anthropologists who are sufficiently interested in the subject to describe hitherto unknown folk games to the wider world.

As to the order of descriptive events, I favour the following:

1. The name of the game. This is more than interesting: you could say it is vital. The name of a game is the portal through which you pass from the real world into that special world in which games are played. The subject of how games get their names and what they mean would make an interesting paper for a future colloquium.

2. Its classification. This relates it to other games and should include a brief account of its distinctive points.

3. Authority. State the provenance of the game, sources of authority, and authority of the person drafting the description.

4. Number of players, and how disposed. (For example, Solo or partnership?)

5. Social status. (Played by men, or women, or mixed? Regarded as childish, intellectual, disreputable?)

6. The gaming equipment and a brief description of how it is to be manipulated.

7. The aim of the game. (I never cease to be amazed at how many game books say nothing about how you win the game until they have gone into excruciating detail of how you play it. At toy fairs, when I ask the inventor or publisher of a new game what it’s all about, I usually have to interrupt them within the first half-minute to say "Yes, that’s all very well, but what are you aiming to do? How do you decide who has won?")

8. Detailed rules of play in the normal course of events, with specifications of what you may and may not do.

9. Special rules governing exceptional cases and occurrences.


12. Pay-off. This may be money, title, prestige, or something else that you carry away with you into the real world. Just as the name of the game is the portal from which you pass out of the real world and into the play world, so the pay-off is the portal through which you pass back out of the play world and into the real world.

These are the main elements of what I consider the basic essentials of a game description, other than rules of behaviour, strategic guidelines, and any so-
called rules relating to a game's thematic, representational or allegorical aspects. *(Note 5.)*

**The "official" rules**

When you sit down to play a game, you all normally expect to be playing the same game - in other words, following the same set of operational rules. Why? Because a fundamental assumption of play is that everyone should be playing on a basis of absolute equality - as they metaphorically say, on a level playing-field. There are apparent exceptions to this, of course. For example, some games are asymmetrical, like Fox & Geese or Entropy, where equality is secured by alternating positions in a series of games. Some games, such as Chess and Go, offset inequalities by handicapping the stronger player. Either way, the object is the same: it is to provide a basic element of fairness. But again - why should a desire for equality and fairness be regarded as fundamental to the play of games?

This brings us on to perhaps the most fascinating and paradoxical characteristic of games - namely, that they are at the same time both competitive and cooperative. They are competitive in that both players want to win and will do everything in their power to do so. In fact, anyone who looks to be uninterested in winning is likely to be considered something of a spoilsport. At the same time, however, they are cooperative, in that both players will be operating within an agreed and equal set of constraints on their freedom to act.

This paradoxical behaviour appears to be a peculiarly human characteristic, as suggested by the following paragraph from Sniderman's essay *The Unwritten Rules*:

> [We read] about a group of scientists who attempted to teach dolphins to play water polo. Although the dolphins were able to learn how to put the ball in the net (and seemed to derive pleasure from doing so), when the trainers tried to get them to stop the other team from "scoring," the dolphins launched an all-out war on the other team's players, using methods that no person steeped in the concepts of sportspeopleship would ever use. After this experience, the trainers gave up their effort, apparently concluding that their task was hopeless, that dolphins couldn't be taught to play the sport. My guess is that they assumed that all the dolphins needed to be taught were the recorded rules of water polo and the creatures would be able to play the game like adult human beings. These scientists evidently did not realize how much of our knowledge of proper game behavior precedes the learning of the statable
constraints of a particular sport.

The problem of authority arises whenever there is a disparity between the sets of operational rules encoded in competing players' minds, thus producing situations in which they disagree on the rules. If they're unable or unwilling to resolve the dispute themselves, they will have to consult an external authority. This raises the question as to what constitutes a valid external authority. I will approach this by reference to what I call levels of association.

Levels of association and authority

The smaller the degree of association among the players, the narrower the scope of authority needs to be. For example, if you're playing a card solitaire, you constitute the smallest possible degree of association of players - that is, none at all - so if you encounter a situation where you're not sure what the rule is, you don't have to consult an authority: you can simply invent a rule to cover it. This probably explains why there are so many different games of Patience, each with so many different variations.

The next level is (what I call) the ad-hoc association of two or more players playing the same game at the same table at the same time. Theoretically, they can resolve a dispute by acting corporately like a single player and agreeing on a rule to cover it. Or they can agree to acknowledge one of themselves as an authority and abide by that player's decision. This may sound a bit far-fetched, but listen to this amazing assertion from Aquarius, a 19th-century writer on card games:

> [As to the] Spaniards of Europe and America [...] Their way of referring to the dealer to settle every doubtful point or dispute is very marked. A book is never mentioned. The decision of the dealer, right or wrong, settles everything or anything, without a murmur, during outplay. Thus little hitches are readily disposed of, and any game can continue. A dealer can ask advice or consult with others, but his decision is his own, and must be immediate. Players come in and leave a game with a substitute very suddenly, and agree to anything done for them. The coolness, courtesy, and skill of the Spaniard at card playing renders him in such things superior to card players of other nations.

I can quote another example of this from my own domestic circle of players. In word games, which we play a lot, one of the commonest queries encountered is whether or not a claimed word is valid. For reasons that I won't go into, no
dictionary is entirely adequate for this purpose. The house rule followed by my group is that a given word is acceptable if at least one opponent accepts it. This may not work for every group of players, but it does with mine, if only because I insist on it!

A group of people who regularly play together can build up a quite a set of "house rules" by following this sort of procedure. Alternatively, of course, they can go to a higher level of authority, such as a book by an acknowledged expert or Hoyle-figure, or the printed rules of a national or international governing body whose rules are widely accepted as authoritative.

At the next higher level comes (what might be called) the group association, which is a group of people who regularly play together, usually at more than one table at a time, and who eventually all get to know one another, such as a local club. Here it is not practicable for each table to make up its own rules, so it is more desirable for the club itself either to devise its own house rules, or to declare itself subject to those of a national or international corporate authority.

The highest possible level is the total association of the whole gaming community - that is, all the players of a given game. Games and tournaments take place beyond the boundaries of a single club, and players will regularly encounter opponents they have never met before. This level of association requires the highest level of authority - such as Japanese Go Association, or the German Skat Federation, or the Fédération Internationale des Echecs - which may be exercised through the recognition of qualified referees, umpires and arbiters.

Despite all these external authorities, it is important to remember that they are authoritative only to the extent that the players agree to observe them. No book should be held to bear an intrinsic authority beyond that of the author’s own competence and experience, nor should the rules drawn up by any official body be regarded as the official rules of the game in question, but only as the official rules of the body concerned. For example, the rule about having to play a certain number of moves within a given period of time is not an intrinsic rule of Chess. And such rules are only authoritative to the extent that players agree to abide by them: they can only be invested with an authority which, by their very submission to it, actually derives from that of the players themselves. By making reference to an external authority they are, in effect, harmoniously and
cooperatively legitimising those rules as their own. As James Carse puts it:

The agreement of the players to the applicable rules constitutes the ultimate validation of those rules. [...] There are no rules that require us to obey rules. If there were, there would have to be a rule for those rules, and so on.

Given that players at the lowest levels of association can assert their own authority and regulate themselves, it is remarkable how often people contact writers of games book, such as me, with a specific query about procedure and ask how it is covered by the official rules. Often enough I reply that there are no official rules for the game in question but that I can either make the following recommendation from personal experience or refer them to someone else whom I think better qualified to pass an opinion. Why, in short, do regular players prefer to seek an external authority?

The obvious answer is to settle queries and irregularities without wasting time; but that is not all. As Steven Sniderman writes:

A game is supposed to be for fun, and, generally speaking, playing the game itself is more fun than playing the meta-game of arguing. [It] is supposed to be for camaraderie, and arguing about the rules leads to antagonism rather than a spirit of friendly competition. Doing things as others have done them in the past allows us to feel connected to our ancestors, our culture, and our traditions; [and] following the rules that others follow allows us to compare ourselves to a wide spectrum of players, not just our immediate opponent(s). Individual players vary in their degree of authoritarianism. There will always be conservatives who look up to a higher authority and are resistant to change, and radicals who prefer to adopt a creative and variable approach to the establishment of norms.

This brings us to the subject of...

**Authority and attitude**

Salen and Zimmerman categorise players according to their "lusory attitude" - that is, their attitude to the rules and practice of play - and present this in tabular form, which I here take the liberty of abbreviating and slightly rewording:

<table>
<thead>
<tr>
<th>Type of player</th>
<th>Lusory attitude</th>
<th>Relationship to rules</th>
<th>Interest in winning</th>
</tr>
</thead>
</table>

http://www.davpar.eu/gamester/rulesOK.html
Enlightening as this is, I can't help thinking it to be significantly incomplete, for it omits the very category to which the authors themselves (presumably), and I (certainly), belong! To it must surely be added that of the games technician - that is, one who is mainly interested in the technical workings of a game, such as an inventor, critic, or experimental player, and who can often be too objective to feel more than an academic interest in winning. Let's try it out:

| Technical  | inquisitive, exploratory, creative, experimental | insubordinate, openly critical | low |

This addition brings me to the final part of the model...

Feedback rules OK

I said earlier that a major cause of change is variable comprehension and faulty transmission, and I think there is an interesting paper to be written on the subject of how games change when they pass from country to country or culture to culture. These might be described as accidental causes. But game rules are just as often modified deliberately. Those I describe as technical players - the inventors and critics - are the most obvious examples of change through critical encounter, or feedback from the play (application) or the board (realisation) to the rules (regulation). Inventing and developing games necessarily involves feedback: it is the *modus operandi* of the job.
Strong players of a strategy game may find it increasingly less of challenge, and seek ways of strengthening its appeal by introducing tighter constraints or more challenging opportunities. Weak players may find it appealing but altogether too much of a challenge, and seek ways of increasing its appeal by reducing its demands. And ordinary everyday players may introduce changes just for the sake of novelty, or to fill what is perceived as a gap - such as the literal gap represented by the Free Parking space in Monopoly. Indeed, the evolution of Monopoly from Lizzie Magie's original Landlord's Game furnishes an excellent example of how the inventor's original vision was virtually overturned by becoming a folk game and undergoing rapid evolution by collective modification. And ordinary players have not stopped modifying it ever since, as Spartaco Albertarelli documents in 1000 Ways of playing Monopoly.

I'd like to think the main reason why I don't play games very successfully is that I'm too much of a technician. It's a good thing there are not too many technicians about, otherwise few games would ever get played properly. In order to keep myself in check I need to remind myself of the following cautionary observations by Steven Sniderman:

> Doing things as others have done them in the past allows us to feel connected to our ancestors, our culture, and our traditions. Players are supposed to be good sports [...], and rule challengers are perceived as poor sports or even spoilsports. [...] A set of rules that has been tested is better than one that has not, so if it [ain't broke] don't fix it.

**Conclusion**

That said, we can finish up with an expanded diagram that also includes explicit rules of behaviour ("Laws"), advisory rules (rules of strategy), and the role of feedback in continuing modification of the operational rules - thus:
References

3. Cardelliccio, Cosimo: *A discussion on the concept of evolution in games*, a paper read at Board Games Studies VI (Marburg, April 2003). (Return)