Defining the Abstract

J. Mark Thompson

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> "Human beings are never more ingenious than in the invention of games."

Leibniz

Games belong to a unique category of artifacts. Like literary works, their internal logic is firmly grounded in humanity in what kind of things human beings are able to understand and to do, and what kind of things give human beings intellectual pleasure. Like epic poetry, many of them are very old, and have attained their present perfection through the contributions of many minds, by virtue of which they express the spirit of a culture. And yet like musical compositions, they exist on a level of abstraction that floats above any physical realization. On one hand a good game may be as esoteric as a theorem of pure mathematics, and on the other it is as human as anthropology. Nothing we do is as human as thinking, and no thought is as human as the thinking we do for mere amusement.

There are many ways to categorize games. For example, there are outdoor games involving athletics; but worthy as these are I have nothing to say about them here. There are games in which an element of chance is decisive, such as roulette or *Snakes and Ladders*: these games are appropriate only for children (if they are complicated) or for gamblers (if they are simple). Roulette, for example, is so simple it would have no interest unless money were involved. On the other hand, *Snakes and Ladders* is so complex it cannot interest an adult, even a gambler, who would correctly perceive it as a tediously complicated way of flipping a coin. Still, it has value in showing children what a game is and how to play: there are rules that must be followed, there is a winner and a loser, if you lose it doesn't matter much because you may win another time.

In fact a strong element of chance is desirable in a game for children because without it they would have no chance of winning when playing against their elders, and so would not learn the attraction for games that every civilized person should feel.

But as long as it is not usually a decisive factor, an element of chance does not exclude a game from serious and intelligent interest. *Backgammon* is an excellent example; even though a match between good players may be decided by the favor of the dice, a good player will almost always defeat a poor one. The same goes for *Pachisi*, and many card games, such as *Bridge* or *Poker*, also call for thinking of the highest level.

Many board games are built around a theme. For example, the fine recent game *Settlers of Catan* has the theme of settling and developing an uninhabited island. Other games have been devised, with varying degrees of success, around themes of the stock market, murder mysteries, the battle of Gettysburg, the plays of Shakespeare, etc. Many commercial publishers put out games that seem void of originality or interest, relying on a popular theme to attract customers. Games for children are again a separate case, since a game need not be original to be fresh to them. But speaking of adult games, although a theme might enhance the play of a good game, a good game never gets its value from its theme.

The games that interest me most are abstract strategy games. The word "abstract" is used because such games usually are presented with no theme, or in which the theme is not important to the experience of playing. Abstract games are thus the "purest" of games. *Chess*, for example, although it has been said to have a theme of war between medieval armies, is clearly an abstract strategy game. Apart from the names of the pieces there is nothing about the game itself suggesting war; it is more suggestive of geometric patterns.

Abstract strategy games furthermore minimize the element of chance. It is essential to their definition that such games have perfect information: each player, when deciding his move, must have complete information about the current position of the board (I include in "position" qualities that may be physically undetectable, such as whether a player may castle), or equivalently, about the

original position of the board and all moves made so far. Examples of perfect information games would include *Chess* and *Backgammon*; games like *Stratego,* *Kriegspiel*, or the recent *Stealth Chess* are not perfect information games. Also, there must be no chance elements introduced by such mechanisms as dice, cards, or dominos drawn at random: *Backgammon* is not an abstract strategy game. And players must move alternately (rather than simultaneously, as in, say, *RoboRally*). There are ordinarily only two players, since competition between more than two generally leads to temporary alliances to defeat whichever player acquires an early advantage, and strategy succumbs to politics.

Contrary to some common assertions, there is an element of luck even in abstract strategy games. For instance, a player might make a move without seeing its value, and later find that any other move would have lost the game. But regardless of such considerations, playing an abstract strategy game is an exercise in logical thought. There is an intimate relationship between such games and puzzles: every board position presents the player with the puzzle, What is the best move?, which in theory could be solved by logic alone. A good abstract game can therefore be thought of as a "family" of potentially interesting logic puzzles, and the play consists of each player posing such a puzzle to the other. Good players are the ones who find the most difficult puzzles to present to their opponents.

The design of a good abstract game must therefore allow an inexhaustible supply of interesting puzzles to be discovered in the possible positions of its board. Equally important, these puzzles must be discoverable and to some degree solvable by the players. Anthropologists from another planet who wanted to study the way human beings think would do well to study our abstract strategy games.

I will consider four qualities a game must possess to have lasting merit: depth, clarity, drama, and decisiveness.

Depth

Depth means that human beings are capable of playing at many different levels of expertise. For most board positions, until the last stages of the endgame, the puzzle of finding the best move

should not be completely solvable. In a deep game, a player must exercise nice judgment in deciding what is the best move in most situations. Depth gives a game lasting interest because the player continues to learn how to improve his play for a long time. If a game has a large following, its depth can actually be measured by recording the results of games and determining how many distinct "levels" there are: if the players in class 1 all lose regularly to the players in class 2, who lose to players in class 3, etc., up to class *n*, then the value of *n* measures the depth of the game. I'm told that *Go* appears to be the deepest of the world's classical games, though some modern games (such as *Star* and *Poly-Y*) are contenders that cannot be measured because they still do not have enough players.

Clarity

But in addition to depth a good game must have clarity. Clarity means that an ordinary human being, without devoting his career to it, can form a judgment about what is the best move in a given situation. For example, if a player has a move that will win the game immediately, it should not ordinarily be difficult to find it. Although *Chess* problems have been devised where a winning move is hard to find, this is usually done by finding a position that misdirects the player's instincts. In a game that lacks clarity, the player simply has no instincts. Even in the midgame there should be some rules-of-thumb which will usually lead a player to a better position. Robert Abbott, the inventor of the chess variant *Ultima*, has lost interest in his creation because he feels it is "opaque." Though *Ultima* has many defenders, anyone who tries to invent a new and original game will find clarity an important issue. The difficulty, with a newly-invented game, is to discern whether a game is "invincibly opaque," or whether with sufficient experience its rules of strategy would begin to clarify.

Drama

A good game should also have drama: it should be possible for a player to recover from a weaker position and still win the game. Victory should not be achievable in a single successful blow; the suspense should continue through an extended campaign. Otherwise an early disadvantage makes the remainder of the game uninteresting:

the doomed player rightly guesses that the puzzle he is trying to solve has no solution and that thinking about it is futile. A game's drama might be measured roughly by matching a strong player against a weak player, and having them switch sides after the strong player achieves an advantage. In a dramatic game the strong player will still have a chance of winning. But the difficulty of defining "advantage" clearly will make drama harder to measure than depth.

Chess is a dramatic game, but its drama apparently becomes more and more subtle as the players become more expert. Good *Chess* players rarely play a game to checkmate: they resign when it becomes clear they cannot win, in other words, when the game has ceased to be dramatic. Masters of the game resign when it becomes clear they must lose a piece without gaining in exchange either an enemy piece, or a positional advantage; grand masters may even resign at the loss of a pawn. The drama of *Chess*, for them, must consist of the alternation of very delicate shades of positional advantage.

Decisiveness

But in addition to drama, a game must also have decisiveness: it should be possible ultimately for one player to achieve an advantage from which the other player cannot recover. *Abalone* has been criticized as lacking decisiveness: there appears to be a strategy which a weaker player can adopt (clumping his pieces together and never extending them, even to attack), which makes it impossible for the stronger player to win. In such a game it is the stronger player who faces a puzzle (How can I push my advantage to a victory?) with no solution.

In "Peak Performance," an episode of *Star Trek: The Next Generation*, an obnoxious alien who is a master of a game called Strategema defeats the android Data. In a rematch Data plays an obstinately defensive strategy, declining even the most promising attacks, until the master of the game resigns in a fury, unable to win. Pity the poor alien, for Data did more than defeat him; he demonstrated that the game to which he had devoted himself was indecisive, and hence futile.

Edward de Bono's *L-Game* is indecisive, and a game between two perfect players would continue forever. de Bono is pleased with this feature, and

remarks on it in his instructions for the game, proving that it takes all kinds.

Even *Chess* at the highest levels is becoming drawish; in matches between world championship contenders, dozens of games are played and most end in draws. Imagine how unsatisfying it would be if contestants for the world championship played fifty games and the victor won 3-2 with 45 draws; one could not help but wonder whether, if the match had been ten games longer, the other player might have been champion.

I list these four qualities because they seem to me to be in tension with one another by pairs: depth vs. clarity, drama vs. decisiveness. For example, if a usable algorithm is known which will always reveal the best move in any situation of a game, then the game's clarity is perfect, but it has lost all its depth. The same is true if any "winning strategy" is known—meaning an algorithm which allows either the first or second player always to win. Such a game (like *Bridg-It* or *Nim*) has been "solved." Similarly, if a game provides the underdog with too many opportunities for recovery, it achieves drama but becomes indecisive, or if a player in a stronger position can win too easily the game becomes undramatic. Only rare games achieve the perfect balance, and this makes such games interesting to contemplate as well as to play.

It is common for serious players at *Chess* and *Go* to report that they can gain insights into the personality of their opponent from his style of play alone, even in correspondence games between players who have never met. The human spirit is perceived in the mere algebraic notation for the moves. The abstract game, this extraordinary medium of expression, should hold an honored place among the liberal arts.

- J. Mark Thompson