# On the Nature of Effective Elimination

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You have experience playing chess, as does your opponent. Each move they make presents you with a challenge, but no challenge presented feels unmanageable. You position, maneuver, and counter-maneuver until you find yourself unsure of what to do. No matter where you move, it would seem to present some notable negative. Move the rook and find your knight exposed, move the knight and their queen is free to take your bishop. You come to the realization that **there is no move that would better your position.**

This particular quandary and its accompanying emotions, like many particular quandaries and their accompanying emotions, has a German word to describe it in its entirety, albeit unaesthetically: *Zugzwang*. This is a term unlikely to be recognised by anyone other than (academically) seasoned chess masters and the occasional game theorist with an appreciation for chess. Zugzwang translates to "*Compulsion to Move"* and it refers specifically to the previously stated scenario wherein there are no choices which better your position, but a choice must be made.

The concept is as under-acknowledged as it is freakishly important to competitive strategic games. It's not just a basis for a thoughtful offensive strategy but is generally essential in the endgame whether you're playing chess or StarCraft. Checkmate, the very object of chess itself, is the strategic initialisation of a particular kind of zugzwang, such that the player has no choice but to make a move which will cause the death of their king. It's not a hard concept to understand, children can and do pick up the heuristics to use these strategies and often do so as though it were innate (and it probably is, the idea that we begin as blank slates has been widely considered bunk for some time). As I often find in the study of economics and game theory, the subjects often serve to codify, model and test for axioms and concepts which are so painfully obvious heuristically that we often pay them no mind even if we ignore them at our peril.

"Between Scylla and Charybdis" was the Greek idiom for zugzwang, a reference to Book XII of the Odyssey wherein Odysseus must choose between bringing the ship too close to Scylla, a 12-footed, 6-headed, snake-necked water-beast with shark teeth or Charybdis, a decidedly unfriendly sentient whirlpool. That being said, viewing the concept through the amalgamated lenses of Game Theory, Neurobiology, and Cognitive/Behavioural Psychology might help codify what we understand heuristically in myth and in anecdotes but not theoretically in codified usage, avoidance and meaning.

Let's consider the concept from this new perspective and see where it might lead us. First, we'll substitute a neurobiology lesson with a cached thought: *we can't understand the science of aggression without understanding the science of fear.* All aggression is rooted in fear. When we begin to feel cornered or begin to recognise obscured threats in the dark, our endocrine system responds immediately. I'm rusty on my neurochemistry and endocrinology, but I remember enough to know that this endocrine response exists to prepare us to fight or run and that the fear response is centered around a part of the brain referred to as the amygdala. I'm less rusty on my behavioural psych and know that our endocrine system does not differentiate much between a potential lion in the bush at dusk or an opponent composing what seems to be a trap in a game of Go.

I'd pay good money to see fMRI brain scans of a person who has just realised that they have no move that would better their position. This is a moment we have experienced universally and, depending on how much

we value the outcome of the game we're playing, we may not handle it well because it's likely to provoke the mentioned fear response. I had the opportunity to spend some time studying the development, usage, and interaction with games by highly isolated and rural Cambodian children. Whether it was in their highly competitive variation of hopscotch or in a game my partner and I could refer to only as the "Rock Game", walk-aways, near-crying or the rough equivalent of table-flipping was not all that uncommon when the children felt they couldn't win against their opponent after investing emotionally in the outcome.

What I think is incredibly important to note is that, in most cases, no zugzwang actually occurred—it was just perceived. This is what Richard Garfield, the creator of the popular card game Magic the Gathering, refers to in his textbook on the principles and mechanisms of games as the feeling of having been "*Effectively Eliminated*". Garfield details three types of elimination from multi-participant competitive games. Strict Elimination occurs when a player is very literally removed from the game as a result of the rules, running out of money in monopoly is a relatable example. Logical elimination occurs when a player has no way of winning, by merit of rules or strict probability, but is still present in the game. Finally, there are effective eliminations, cases where players make a plausible inference regarding their current state heuristics that they are effectively eliminated from winning. In Othello this could mean that they slipped up and allowed an opponent to take a third corner. They are still in the game but they do not **perceive** any path to victory.

Take a moment to remember the last time you were playing a game, literal or metaphorical, and felt there was no perceivable path to victory. Try to think of the associated emotions. This condition is a universal part of the human experience and while it can be a whole lot of fun to induce, it's not so fun to be on the receiving end. If we have little emotional stake in the outcome, we might commend our opponent on their ability to leave us trapped, but in the case that emotional stake is notable we are proportionately likely to have a proportionately notable emotional response. When designing systems with the potential for competition between participants, effective elimination is something to consider.

If we should design a system which has the potential for or could be defined by its competitive interaction between participants, we must consider that the feeling of effective elimination can cause a set of nuisances which are extraordinarily difficult to right. These nuisances can be fatal or simply bothersome depending on the nature and importance of your system, but they should likely be considered regardless. The set of associated behaviours include but are not limited to vindictiveness and revenge, purposeful disruption, deliberate mishandling, cheating and rule bending, tantrums, violence and aggression, cognitive shut-down, and walking away. I'd argue that it's important to acknowledge that the potential for these outcomes is present whether we're talking about isolated Cambodian children playing homebrew games or adults in New York City trading on the stock exchange.

Speaking to players of an obscure online community, people who play Age of Empires II competitively, I found some credence for the consequences of ignoring the potential for and handling of the feeling of effective elimination. Age of Empires II is a real time strategy game played in sessions that can last from 10 minutes to 3 hours depending on the skill of the players and game mode chosen. Players noted it as an inevitable occurrence that they would play against someone for a reasonable period of time only to start winning and then have the opponent walk away from their computer. Even if the opponent walks away, it will take some time for the player to go about ending the game, but now they do so with none of the fun. It's just busy-work. The other player had the opportunity to forfeit but chose instead to spread assets, hiding them in the remote corners of the map to make it as burdensome and as time consuming as possible for the player to actually end the game. Many players will recognise this and simply forfeit the game themselves, sacrificing their own track-record and giving the opponent the victory. I don't believe every player who walks away intends to be vindictive but walking away on its own can be quite damaging to the other participants' experience. This

reoccurring experience has led many people to walk away from the community as they felt effectively eliminated from winning before the game even began.

To move outside the realm of what is traditionally understood as "games", we can look at the overlapping online communities of Stack Overflow and Stack Exchange question-answer sites. The toxicity of the community on Stack Overflow and Stack Exchange has been growing for some time now. Looking at the complaints, it seems that a lot of people have just stopped interacting, for what is undeniably a case of feeling effectively eliminated from achieving success in the interactive use of the site. More important to note is that Stack offers high likelihood for public argument and public argument is always on the precipice of devolving into name-calling and toxicity. One of the easiest ways to trigger a tailspin in public debate is a zugzwang. The face-saving behaviour it may trigger tends to be volatile. It is here that even the rational may quickly enter the proverbial lawless west of ad hominem and outrage. Winston Churchill's words: "beware of driving men to desperation, for even a cornered rat is dangerous" came to life on the stage of the 2016 Republican Primaries just as they do in arguments between users of Stack.

Cicero, the famed Roman senator and orator, used the fact that his opponents would respond emotionally to such traps as a weapon. Let it be a lesson that, even he, a man famed for his wisdom, pragmatism and pragmatic embrace of stoicism, who was so well aware of the nature of effective eliminations was not at all immune to their effects. Despite all his success, Cicero had no noble ancestry, he was what was called "novus homo" or new man. He had no famous or historically important ancestors, and this set him apart from his colleagues, members of the Optimates, literally translated to "best ones". He felt effectively eliminated from winning the game of which he was a part because he was born to the wrong parents and it showed in how he attacked his opponents belonging to this class.

I think an argument could be made that many of the problems we see in western society at the moment are the result of widespread feelings of effective elimination. Whether it's dropouts, women, or minorities in the workplace feeling they'll never be accepted by the optimates of their respective settings or the middle class as a whole feeling they'll never surmount the responsibility of children, debt, and house payments with no expectation of promotion or job security there is an organic response of discomfort and, eventually, outrage. When I was running my college's honors program there were times while attending academic conference that I saw ivy league or foreign university students who made other students feel less than. Some did so by accident, some did so with malice, I remember all too well the contempt felt and the resulting segregation.

More personal for me is the study of mathematics. When I teach or tutor in mathematics, I find that the biggest battle of the war is fighting with the student's feelings that they're dumb or not capable which is something I've felt myself more than once. If you're explaining something to someone and you feel you're just not getting through, take a moment to look at their body language, if they look defeated and are using self-comforting body language or if they look cross or are pursing their lips: **start over**. They're likely not even parsing what you're saying any more.

We might now be prepared to migrate from the anecdotal to the theory. There is a flawed assumption *within* economic theory, which is that the participants are rational. There is a flawed assumption *regarding* economic theory, which is that economics only concerns the allocation of monies. John Von Neumann stated clearly that unless we acknowledged and worked on the assumption within and assumption regarding economic theory, it would be doomed to be a soft science. Let us clarify that economics is the study of the allocation of resources, tangible and intangible. Understanding the action economy or the economy of choice is paramount when designing systems that rely on user participation. Equipped with this new perspective, we can proceed.

When we feel effectively eliminated, the potential for emotional instability heightens. When we're emotionally unstable the potential for irrational choices heightens. Our own emotional state is sensitive to the

emotional state of others and detecting irrational choice in others tends to provoke a fear response of its own and the action economy begins to become inefficient. This fear response to detection of irrationality has been the subject of intense study at the pentagon and a subject of interest of mine for the last few years.

If given the opportunity, we may have several options in preventing the feeling of effective elimination and maintaining an efficient action economy in the systems we design. We might prevent precursory face-saving behaviour by using more informal private discussion when things begin to get heated, which seems to be the case with the National Diet of Japan (their legislature). We could prevent mismatching the skill-levels of participants using more advanced methods than simple ELO rankings to provide higher likelihoods of balanced competition. In some cases, we may need to redesign the game. Test your users, if they consistently feel effectively eliminated from making use of or otherwise winning within the system very early into its use perhaps its not them—it's the system. Maybe they need proper training or development. I remember encountering trading software that I was given, for free, and then didn't use because there was just too much going on in front of me. It made me feel underprepared and ill-suited to my profession, but eventually, I called their helpline and a representative walked me through it. I ended up using it daily for quite some time. It turned out they were using their own acronyms which I confused for industry standard jargon I wasn't familiar with. We need to make sure we don't make uninformed suppositions about what our users know.

Authoritatively redesigning society might not be such a great idea, (further reading: Pol Pot, Mao, Stalin, Hitler etc.), but when we have the opportunity to have authoritative control over the design of our own systems, it's painfully obvious that we ignore the potential for effective elimination at our own peril.