

WHY DO WE PLAY GO?

Byron Russell

AI generates thought from code, QR Codes let smartphones bring static grids to life, and Conway's Game of Life allows living systems to emerge from dots. They all emerge organically and boundlessly from finite seeds, and share these qualities with their common origin, the game of *GO*.

It was said there are as many board positions as atoms in the Universe, but that was before the James Webb Space Telescope. 361 factorial is still an undeniably large number, but fails to convey why that many possibilities makes the game so compelling and paradoxical, nor how rewarding it is to try to wrap our minds around it.

Forty years ago, in Oakland, I was first introduced to *GO* by my high school math teacher, Thomas Rike. He ran a casual club at lunch time in the back room of his class, frequented by mathematically oriented students. It was casual, not competitive, and there were no strong players, but we enjoyed playing and marveled at the ups and downs, and odd situations that presented themselves during play.

Without partners, I gave up the game when I went to college. But the allure of *GO* never completely went away, even in times when my *GO* board sat in a closet. No matter how much or how little I played, it was always a rewarding experience, challenging and entertaining, but also calming and focusing. I was lucky enough at times in my life to live in places where the game was popular. In Fresno, I have to go online to find a match, but I run a monthly *GO* club to spread the game. If you told me when I was young I would start a *GO* club, and join the board of the American Go Association, I would have laughed in disbelief, but here we are.

I slowly came to realize what makes *GO* inexhaustibly rewarding, and ultimately worth sharing. In principle, *GO* is just a couple premises: Take turns putting stones down one at a time on a grid. They never move but can connect to adjacent stones of the same color or be captured if surrounded. That's it. Those are the only fundamental rules of the game. Counting, life and death, territory, *seki*, and *ko*, emerge as themes. They are a few of the properties and edge cases that add to the game's complexity. Their descriptions make it more efficient to play and learn, and to solve disputes quickly. They are fascinating, and consequential, but not intrinsic.

We who teach the game struggle with this complexity. We reach for cosmic and organic metaphors, but lose sight of the underlying

simplicity, mystifying our audience. We would be better off introducing the game in a distilled way to make it simpler, faster, and more intuitive to get off the ground, to allow a new player's understanding to emerge the same way the game itself emerges.

GO is truly unique in this respect. It is *fundamentally emergent in nature*. It might be better to say GO was discovered, rather than invented. This insight inspired Lasker's famous quote about aliens, and argues this emergence happened far earlier in human history than we currently presume, many thousands of years ago. GO is a living metaphor for the nature of the Universe at its smallest scale. From a few fundamental elements, infinite and profound diversity emerges. A point in the fabric of the Universe may have a positive, negative, or neutral charge. A point on the board can have a white stone, black stone, or be empty. Yet for AI to understand the game about two dozen possible states must be considered.

Even AI has not 'solved' the game, and in order to become stronger than a human, must play a staggering number of lifetimes worth of GO. In this respect, AlphaGo and other AI are themselves a testament to our ability as humans to leverage our finite minds to their maximum potential. It is proof of our talent for making intelligent decisions with incomplete information.

GO remains well out of reach of our attempts to plumb its unfathomable depths, creating space for a kind of magic to happen. We are forced to utilize the best of our rational minds, our logic and critical thinking skills, but must also activate our creativity and intuitive power to play at the highest level. GO is a constant test, an attempt to find a perfect answer, but ironically punishing when we try to play by rote, as even one stone out of place can alter the outcome dramatically. It pushes us to search for balance and deeper understanding. No matter how much we study, we still play better when we try to come up with our own answers. It is a zero-sum game played on a finite grid, fundamentally binary and discrete, yet as organic and effectively infinite as a finite set can be.

In the end, a pile of stones and a grid is all it takes to help us touch the infinite, to see our own potential reflected back at us. This riddle is why GO players become obsessed with the game and its growth. GO repays our investment inexhaustibly, so let us keep cultivating GO in our garden to continue enjoying its many flowers as long as we have minds to think. Why do we play GO? We play because it rewards our futile efforts at mastery, at once the simplest and most complex game imaginable.