

The Symmetrical Chess Collection

A mathematically-sound introduction to the universe of chess variants!

**45 games
45 variants**

Various games invented 2002-2003 by Derek Nalls.

Various games implemented 2002-2003 by Derek Nalls and L. Lynn Smith.

Special thanks to Ed van Zon and Jens Markmann for their advice and guidance along the way. Supreme thanks to the principal architects of the Zillions program for making all dreams possible.

I would classify myself as a moderate amongst inventors of chess variants- neither an unimaginative conservative clinging to familiar, standard chess nor a radical embracing all types of crazy gameplay unwisely and uncritically. An optimum balance of desirable game features at their apex exists, unique to this collection, which was extremely difficult to attain- requiring appr. 4 years of work to reach its maturity or ultimate refinement (hopefully).

Of the game designers who even understand and respect such theoretics, the majority accept or believe that many desirable game features exist or work intransigently at cross-purposes. Indeed, these inverse relations (which can easily be discovered by anyone experimenting with game designs) possess a mathematical logic which seems to be inescapably true at a cursory glance. Yet with an incisive understanding of combinatorial game theory (as applied and advanced to a new, formally ill-defined area of chess variant design) as well as a mastery of the relevant tools provided by the Zillions program, all of the stale or unacceptable compromises can be overcome and avoided while an optimum balance can be achieved.

Quality chess variants can only be created in accordance with ALL known, valid, important theoretical design principles available to the present day ...

IF the knowledge and tools available to the present day are adequate.

My assessment is that they are definitely adequate today and perhaps, today's standards or definitions of quality will always remain adequate. However, until only a few years ago (i.e., when the Zillions program was introduced in 1998), adequate knowledge and tools certainly did not exist. Incidentally, the odds against creating a quality chess variant by chance involve combinatorically-high values.

Overall, the literature of chess variants demonstrates a random scattering of 1000's of the infinite possible, stable [not in every case!] arrangements of boards, pieces, rules, etc. Despite the constructive intentions, hard work and abstraction by their various inventors, it is as if the population as a whole which created this class of games did so without the guidance of intelligent design. Nearly all of these games could have instead been randomly generated by a computer running a program

written solely to create poor chess variants. This is the fate of nearly all work undertaken without applying the most important design principles.

Since the advent of the Zillions program, the vast majority of the numerous, new chess variants have NOT improved in non-trivial ways. The bad examples of ancient and/or popular work worldwide continue to be used to disastrous ends.

Standard chess, for example, is a yet another poor game. [It is abstract junk which demonstrates an appalling absence of most quality criteria.] For it to be otherwise would be a miracle considering its ancient, piecemeal development. Those who are unable to accept this reality may still be able to play and enjoy chess variants (as well as standard chess). Notwithstanding, they will likewise be unable to correctly discern the difference between a quality or a poor chess variant due to their deficient understanding of this subject.

All of the chess-related games in this collection are fast and dangerous yet theoretically-deep and stable. All of the chess-related games in this collection are easy to start playing yet hard to master.

The mathematical nature of the universe of chess variants is ever-intriguing. I approach this subject as a 2-D geometrician. I never expected to find so many interesting geometric patterns, angles, arrangements for boards & pieces, suitable for creating unique, quite-playable games, while restricting myself to using only sliding pieces of unlimited range. After all, I only allow a few special moves (dropping, rotation, portal travel) which I consider play-enhancing to be used in any of my games. I have critically examined nearly all of the many other special moves possible in detail and found them to be play-degrading (in contrast to their game inventor's intent).

Ironically, I have always strictly used an increasingly-long list of quality criteria to keep the number of my creations as low as possible. The "freedom I allow myself to restrict" defines my unique style and protects the quality (by my attempt to establish standards mathematically). Technical value judgments are unavoidable to any definition of quality, nonetheless. All of these games have many common characteristics and overall continuity as they span a spectrum or lineage of unique methods for seemingly-mature adults to "fight intensely over a king".

Chess variants have the amazing, singular distinction of being both the most complicated games known (by combinatoric measure) which are classifiable as perfect-information games. With the exact location of all types of pieces on the board defined physically to certain spaces, all pieces play-out with visual, geometrical clarity. The board is essentially a geometric playground or finite universe of small, manageable size within which the pieces can be played in an extremely vast (although finite) variety of ways.

All of the chess-related games in this collection are played upon boards which, with the pieces for each of the 2 players set to their opening positions, maintain perfect bilateral, geometrical symmetry via vertical and horizontal axes.

Games built upon boards constructed of spaces can be best accomplished using regular polygons that can be replicated without loss of space. This leaves only spaces with 3 sides (triangles), 4 sides (squares) or 6 sides (hexagons) which meet the criterion. The maximum number of geometrically-contiguous directions of movement available with triangular spaces is 12, with square spaces is 8, with hexagonal spaces is 6.

The 6 60° angles dealt with on hexagonal-spaced boards are all familiar to triangular-spaced boards. Clearly, there is no comparative advantage to designing hexagonal-spaced games instead of triangular-spaced games unless for the novelty. So, I have created no games based upon hexagonal-spaced boards for this collection.

Square-spaced boards are unique compared to triangular-spaced boards due to 4 of their 8 45° angles being unfamiliar to triangular-spaced boards.

Triangular-spaced boards are unique compared to square-spaced boards due to 8 of their 12 30° angles being unfamiliar to square-spaced boards.

In my assessment, the alternating orientation of the triangular spaces are needlessly distracting or confusing to potential players. So, I have created no games based upon triangular-spaced boards for this collection. Anyone who differs in their opinion is free to create any number of games based upon triangular-spaced boards.

Consequently, all of the games in this collection are based upon square-spaced boards. Note that all boards maintain vertical and horizontal axes of symmetry instead of diagonal. This is due to the strong desirability of maintaining equality of piece values between the two color-bound pieces (i.e., light-spaced and dark-spaced bishops) throughout a game. A maximum of 200 live squares within a maximum dimension (H or W) of 24 squares overall are allowed for the board. Accordingly, a monitor and video card capable of attaining a resolution as fine as 1600 x 1200 is recommended to conveniently display the largest games in this collection.

There are only a handful of people currently creating chess variants for 3-D. I am not one of them nor do I ever intend to consider becoming one of them until-unless the Zillions program is rewritten to handle 3-D graphics well.

Sliding pieces of unlimited range are the only types of moving pieces used in any of these games because they do NOT waste or miss any board spaces in their given directions of movement. Essentially, leaping pieces are out-of-tune, ill-fitted to their

geometric environment as they waste or miss spaces and move at odd angles to contiguous, available board spaces. Sliding pieces of limited range are undesirable because they unnecessarily slow down the game. Generally, 24-36 pieces per player are required at the start the game to insure stability for a 2-D game (where only sliding pieces of unlimited range are used).

There are 3 or 7 unique sliding pieces used in various square-spaced games with 4 or 8 directions of movement. The 2-D symbols used to represent these pieces are visually indicative of the directions in which they are capable of moving in 2-D. Their geometric, straight-line 1-D movement chosen is as a ray visually clear, direct and as sensible as a projectile or a beam of light.

There are 11 sliders theoretically possible in 2-D with 4 or more directions of movement (in pairs of opposite directions). However, all 4 6-directional moving pieces are deficient in unique, strategic move possibilities with respect to game design (at least, to the limits of my imagination). I have found 7 select sliders to be useful in various games.

Of the 7 select sliders, 3 are "pure sliders"; 4 are "hybrid sliders". A pure slider is symmetrical (i.e., invariant under transformations) in its movements with respect to 4 axes which can be cut across the 2-D board orthogonally or diagonally. A hybrid slider is asymmetrical (i.e., not invariant under transformations) in its movement with respect to 4 axes which can be cut across the 2-D board orthogonally or diagonally.

[Note- It is permissible for me to use these asymmetrical pieces within symmetrical games because they are carefully balanced geometrically in pairs in their opening positions by an appropriate arrangement to achieve holistic symmetry.]

The 3 pure sliders are already familiar to anyone who has played chess. They are the bishop (4-directional: diagonal), the rook (4-directional: orthogonal), the queen (8-directional: diagonal & orthogonal).

The 4 hybrid sliders are unfamiliar to nearly everyone. They all have an orthogonal and a diagonal component to their movements. They can be regarded as all 4 possible crosses between a bishop and a rook. They are the zig-zag (4-directional: horizontal & NE-SW diagonal), zag-zig (4-directional: vertical & NW-SE diagonal), zag-zag (4-directional: vertical & NE-SW diagonal), zig-zig (4-directional: horizontal & NW-SE diagonal). They can be referred to as a class by "ZZ pieces".

Of the 7 select sliders, the queen is the only 8-directional "universal slider". All 6 others are 4-directional "basic sliders". As such, a bishop fused with a rook equals a queen; a zig-zag fused with a zag-zig equals a queen; a zag-zag fused with a zig-zig equals a queen.

A remarkable reality of game design is that where only sliding pieces are used, a single, best opening setup for a given board game is always precisely, tightly definable. In contrast to nearly all chess variants invented by others, the chosen opening setup for every game is NOT determined arbitrarily (i.e., as one of many adequate possibilities) or thru hopefully-intelligent guesswork. If either were the case, the yielded result would almost surely be less than ideal.

Furthermore, the exact board design determines exactly which sliding pieces are used, in exactly what numbers and their exact opening setup. The principle is elegantly simple. Nonetheless, the exact board design required for a game is not known at the beginning of the invention process. Its determination entails a complex, interdependent process wherein the board design must be adjusted and tested to accommodate the needed sliding pieces appropriately arranged to meet all offensive and defensive requirements.

Complex strategies are built upon the simple foundation of a single, linear move by the staggering number of relevant possibilities and multi-move approaches. The pieces (with their movements) are analogous to simple, moving parts interconnected within a large, complex machine you control, engaged in battle against a large, complex machine controlled by your opponent. In other words, playing these games is comparably fun to ripping your enemy to pieces with a chainsaw ... as your enemy is ripping you to pieces with a chainsaw.

To be sure, all sliding pieces are power pieces. Considerable pressure exists upon both players from the first move of the game. It should not be surprising that games consisting exclusively of sliding pieces are fast, dangerous as well as alarmingly, irreversibly destructive. The theoretical depth of all of these games is tremendous, however. It would be grossly mistaken to pre-judge any of these games as being recklessly, destructively satisfying yet intellectually worthless.

Game stability and a minimal first-move advantage are assured due to opening positions in which neither player can capture an opponent's piece, trap the royal pieces (which are or can be very well protected) or irrefutably take decisive positional/material advantage. Black is insured an equal number of moves as white before the game can end. Furthermore, there is (as there must be) absolute equality, balance and mirror-image symmetry between the 2 armies at every opening position in every game.

Due to the unlimited range of the sliding pieces used, offensive and defensive structures often become interconnected with some pieces being used (or usable) in both ways. Correctly deciding between the various, complex offensive and/or defensive priorities is critically important at numerous moves during a game. Exclusively offensive or defensive strategies will lead to defeat against a capable opponent. The key to victory lies in being more resourceful than your opponent at handling, balancing both well simultaneously. In a typical, close endgame,

the winner is the one who is able to maintain stable defenses with minimal pieces while freeing up maximal pieces possible to launch effective offenses which overwhelm the defenses of one's opponent.

In every game, there is only one method of victory- to capture one royal piece which is totally incapable of movement, termed a "frozen king". This minimizes the chances of a draw. Incidentally, a draw occurs if both players capture each other's frozen kings within the same-numbered move. This must be admissible to maximize fairness, equality and balance.

The conflict between the 2 armies is maximized along the vertical orthogonal running between the 2 frozen kings (also, the vertical axis of symmetry) where both the defense of your frozen king and the offense against your opponent's frozen king entail establishing lines of attack. In all games, the boards and opening positions are such that the frozen king can be attacked from 3-6 angles- always a mixture of long-range and short-range angles; always a mixture of orthogonal and diagonal angles. The fatal line of attack is equally likely to come from any angle.

Essentially, chess variants are complex, dynamic mathematical machines. As structure defines function, more incisive lines of play progressively approach defining a game itself geometrically thru its best resourceful, holistic, long-range possibilities (i.e., moves) within its characteristic, limited universe- a dynamic, mathematical machine.

In my opinion, great play at chess-related games reaches a level of abstraction where it is difficult to distinguish or correctly attribute the qualities responsible. Science or art, calculation or understanding, knowledge or imagination, logical programming or intuition to survive- which opposite methods or qualities are strongest? Hopefully, the best chess-related games invented (or yet to be invented) will be ruled by talented humans instead of computers for a while to come. The Zillions program requires a great amount of time to play the majority of these games reasonably well, the minority of these games badly ... yet many intelligent humans can beat it at any game they dedicate themselves to playing.

I welcome thoughtful, constructive correspondence from anyone.

Please report any errors or inefficiencies observed or discovered thru playing my games or upon examining their programming (*.zrf).

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www.symmetryperfect.com/shots