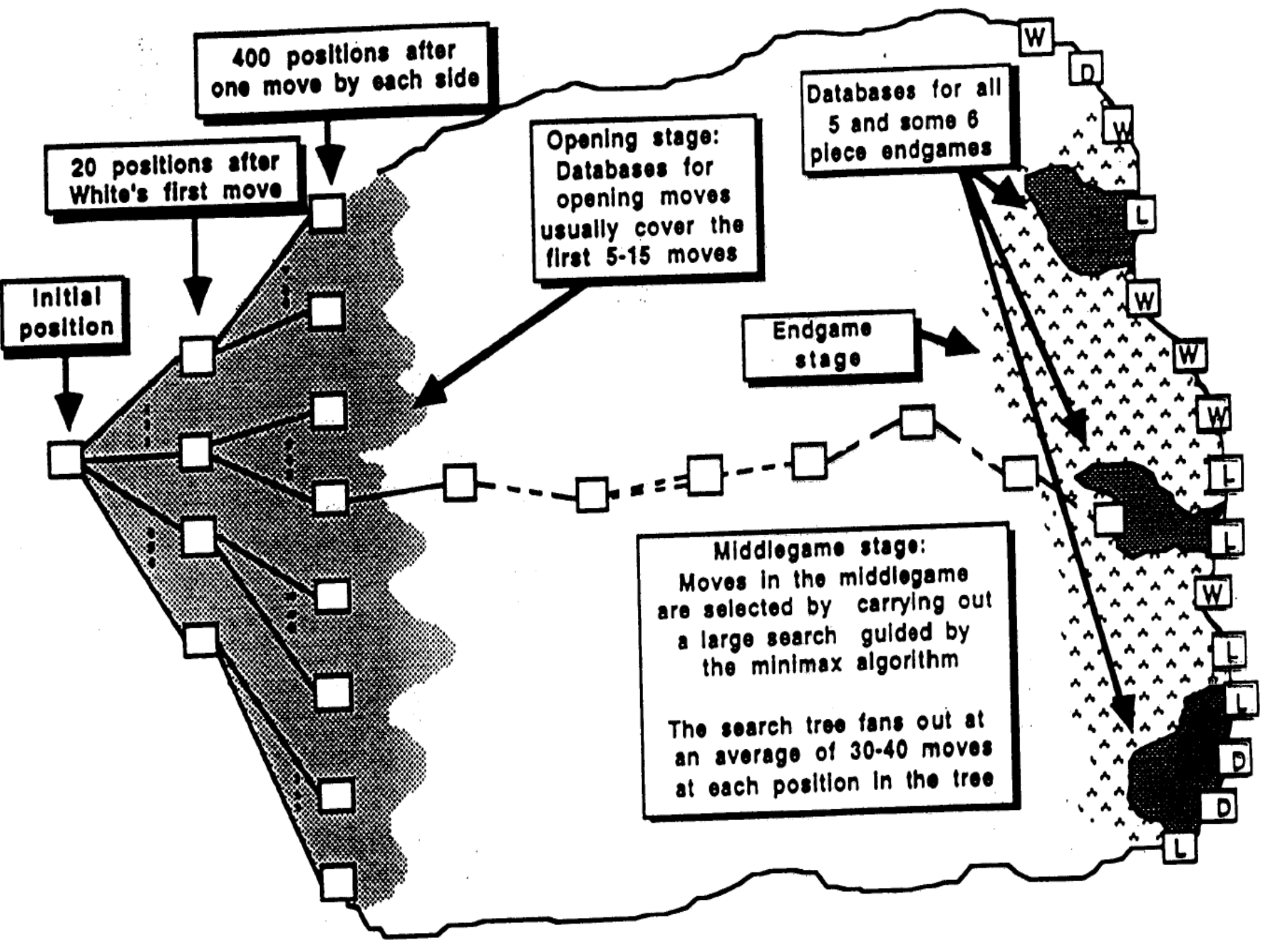
Chess

(Slides from Oren Etzioni, Andrew J. Parks)


400 positions after one move by each side
20 positions after White's first move
Initial position
Opening stage: Databases for opening moves usually cover the first 5-15 moves
Databases for all 5 and some 6 piece endgames
Endgame stage
Middlegame stage: Moves in the middlegame are selected by carrying out a large search guided by the minimax algorithm
The search tree fans out at an average of 30-40 moves at each position in the tree
W
D
W
L
W
W
W
L
L
W
L
L
D
D
L

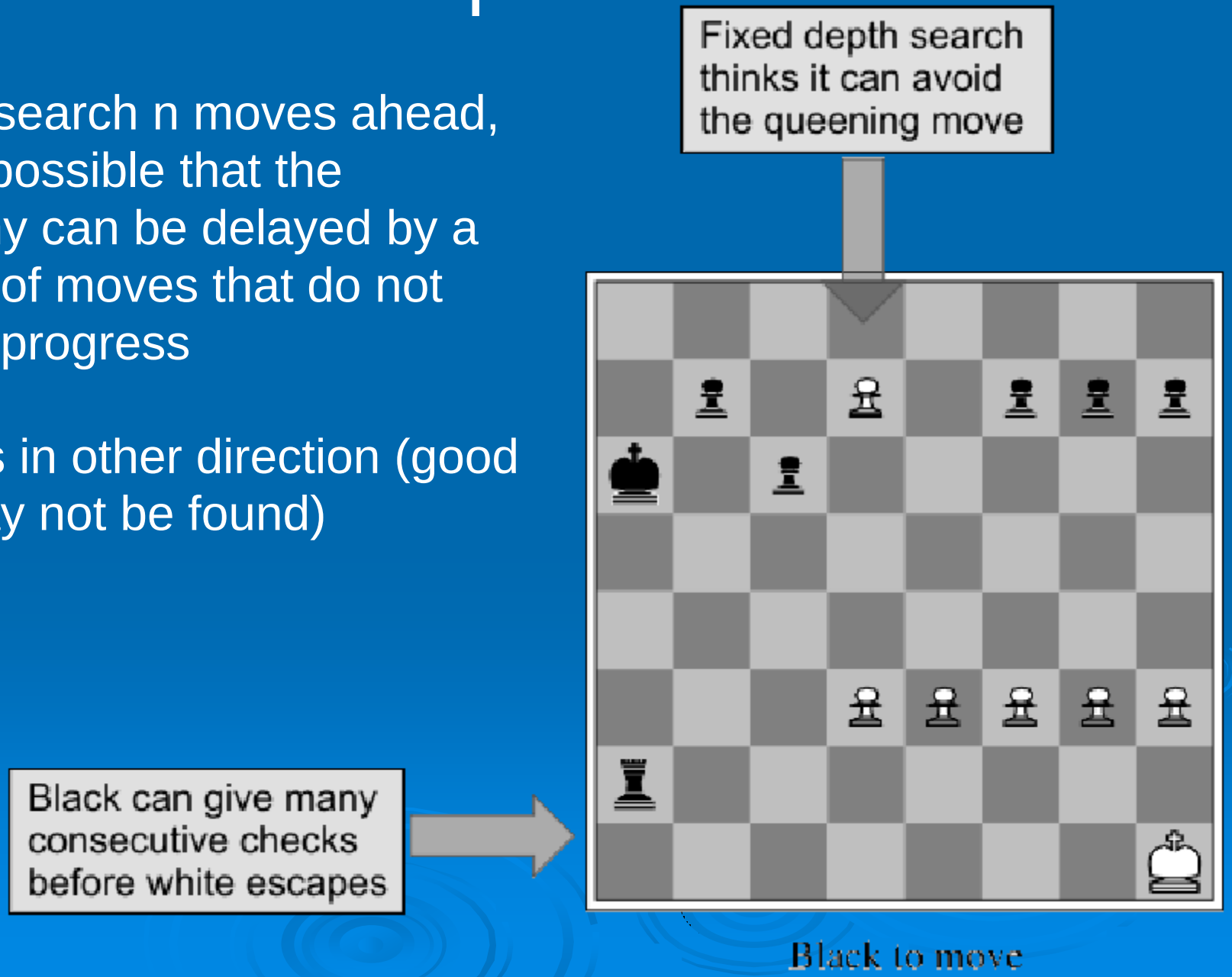
Horizon Effect

The problem with abruptly stopping a search at a fixed depth is called the 'horizon effect'

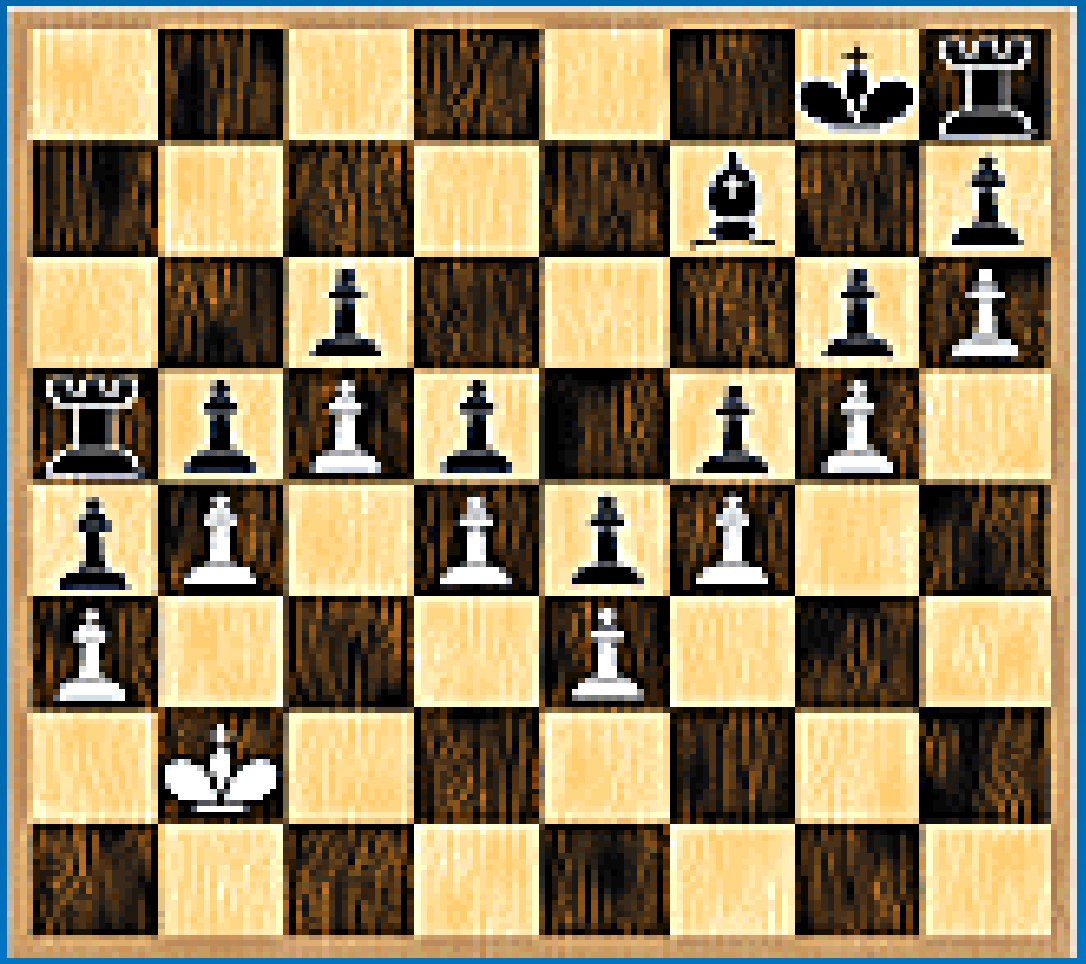
Problem with fixed depth Searches:

if we only search n moves ahead, it may be possible that the catastrophy can be delayed by a sequence of moves that do not make any progress

also works in other direction (good moves may not be found)



Chinese wall effect



This is how humans excel at chess.

Quiescence Search

This involves searching past the terminal search nodes (depth of 0) and testing all the non-quiescent moves until the situation becomes calm, and only then apply the evaluator.

Enables programs to detect long capture sequences and calculate whether or not they are worth initiating.

Expand searches to avoid evaluating a position where tactical disruption is in progress.

Null Moves

Shallow search after letting your opponent move twice

Generates **lower bound** on value of position

Lookahead using today's (commodity) hardware

Minimax: 5 ply
Alpha/Beta: 10 ply
Null moves/forward pruning: 14 ply

To get to grandmaster level, need:

* **tuned** evaluation function
* extensive database of opening moves
* endgame database

Match History..

- The first match (series of six matches), between Deep Blue and Gary Kasparov was played in February 1996 in Philadelphia, Pennsylvania
- Result 4 -2 (Kasparov).
- The rematch was held May 3-11 at the Equitable Center in downtown Manhattan (1997).
- Result 3.5 – 2.5 (Deep blue)
- The rematch witnessed the shortest game between man and machine at this level.

Deep Blue...powerful because?

- 30 nodes with 18 dedicated chess processors each?
- carefully tuned evaluation function, forward pruning/null-moves, endgame database?
- database of grandmaster chess openings?