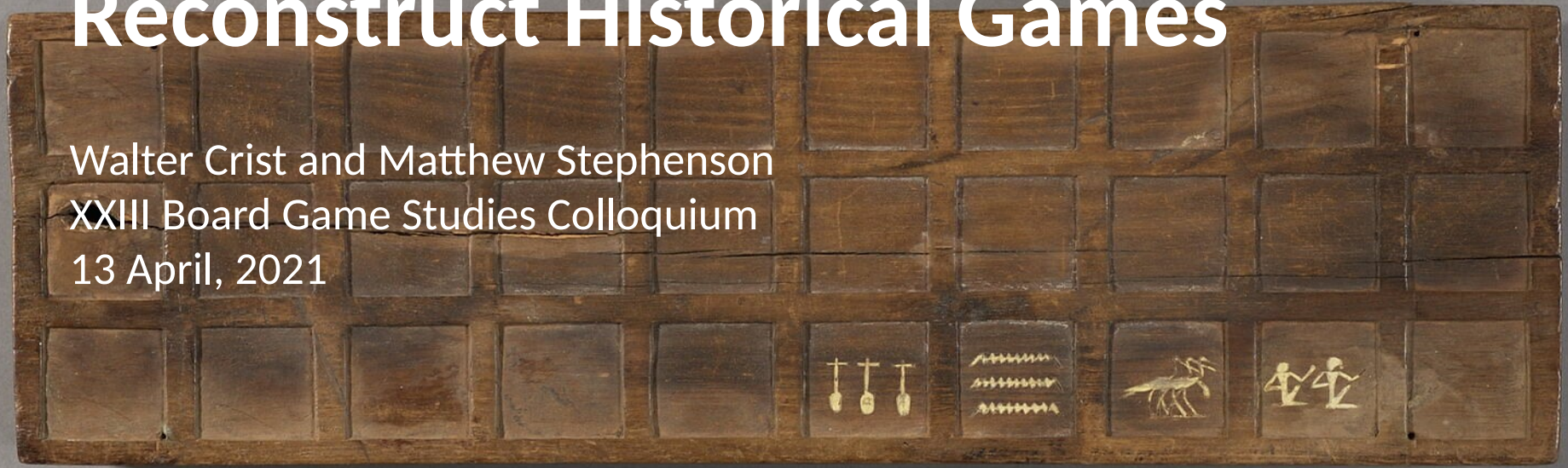


# Compiling Evidence to Reconstruct Historical Games

Walter Crist and Matthew Stephenson  
XXIII Board Game Studies Colloquium  
13 April, 2021



Senet game box; Egypt, Louvre E2710

# The Digital Ludeme Project

- 5-year ERC funded research project  
Run by Cameron Browne
- Using the available historical evidence, use Artificial Intelligence to:
  - **Model** and preserve the knowledge of games from the past
  - **Reconstruct** missing knowledge
  - **Map** transmission of games



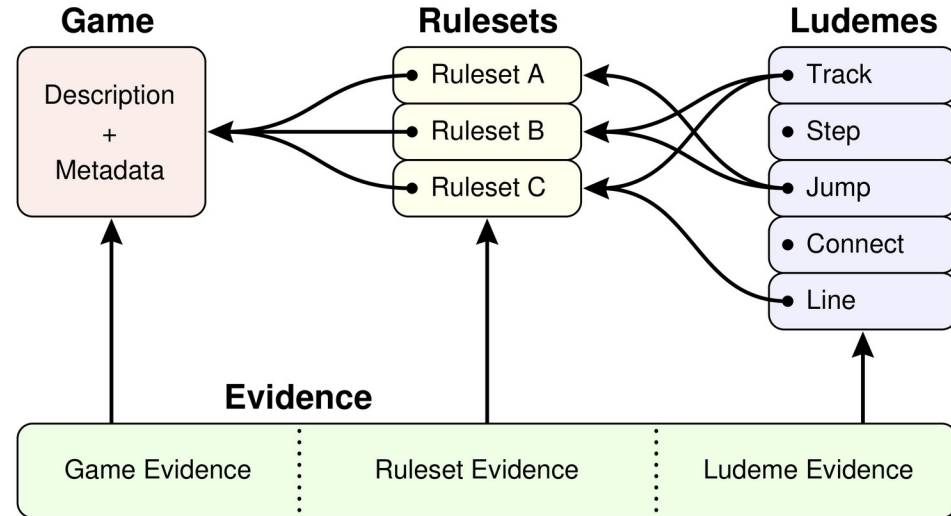
European Research Council



Maastricht University

# Evidence-based Approach

- Evidence: anything which provides information about the rules, location, or chronology of a specific game
- Artifacts, Texts, Ethnographic Accounts, Artistic Representations



# Types of Evidence

- Artifacts
- Artistic Representations
- Texts
- Ethnography



*Les joueurs de tric-trac, Maître des jeux 1650, Louvre*



# Required Information

- Game Rules!
  - Materials, roles of players, allowed, required, or restricted actions
- Geographic Location
- Chronology
- Social information
  - Class, gender, age, space

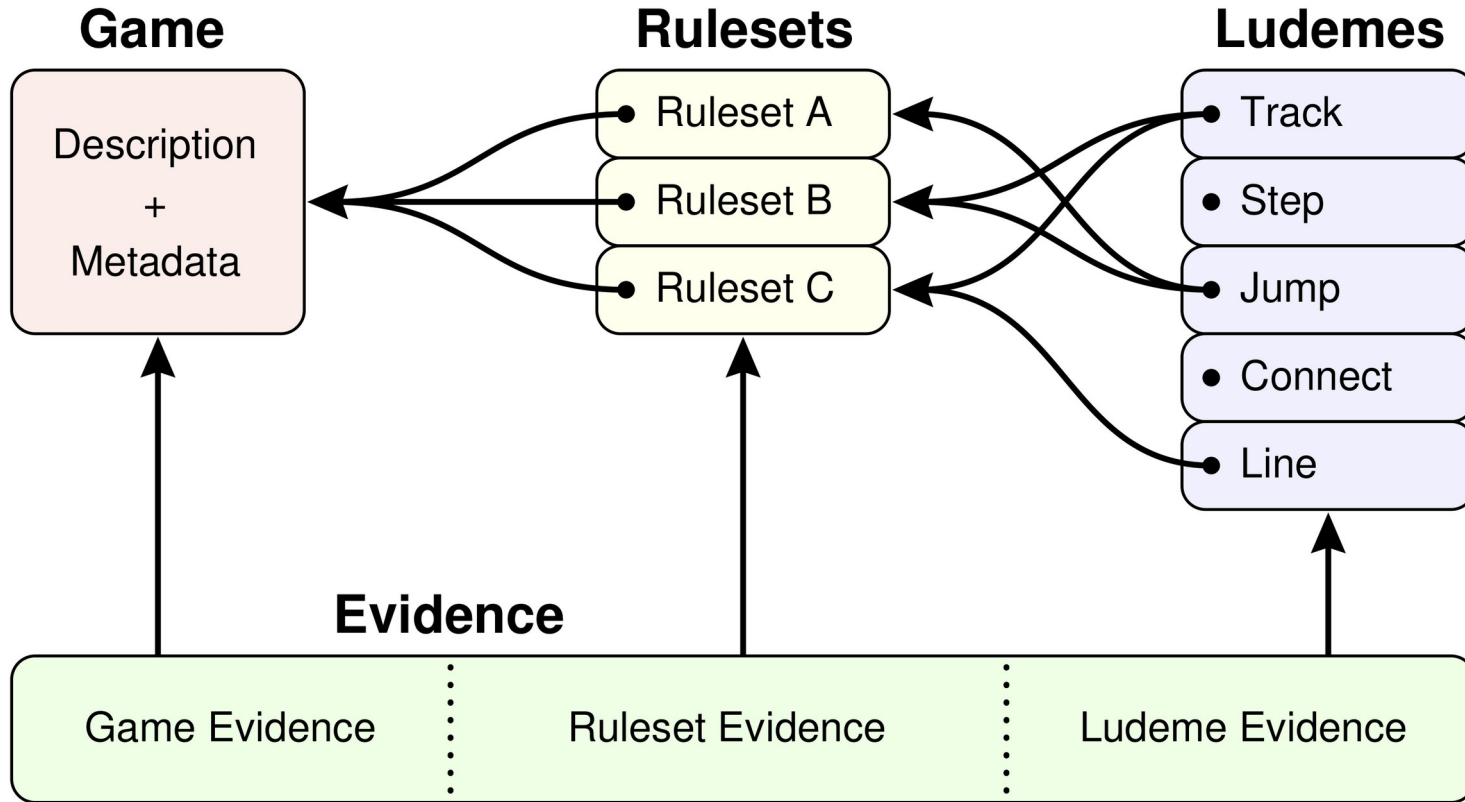


Mehen Game Board; Louvre E 25430

# Uncertainty Factors

- Used in cases where the nature of the evidence creates questions about the content
- Incomplete; Graffiti; Written about foreign culture; Secondary texts; Unrepresentative depiction; Insufficiently described rules





## Games

Implemented in Ludii ☐ Included in DLP ☒ Contribute ☐ 1000 found



Name / Id / Author	Period	Region	Category						
<input type="text" value="Search"/>	<input type="text" value="any"/>	<input type="text" value="any"/>	<input type="text" value="any"/>						
<b>10-Ring</b> Ancient Southern Europe <i>Awaiting Reconstruction</i>	<b>12-Ring</b> Ancient Southern Europe Reconstruction, Board, Race <i>Awaiting Reconstruction</i>	<b>20 Squares</b> Ancient Northern Africa, Southern Asia, Western Asia Board, Race, Escape	<b>33 Circles</b> Ancient Northern Africa, Central Asia, Southern Asia, Western Asia Board, Race <i>Awaiting Reconstruction</i>	<b>58 Holes</b> Ancient Northern Africa, Central Asia, Southern Asia, Western Asia Board, Race, Escape	<b>A'Kash'i</b> Modern Central America WinHisDLP, Race <b>TODO HELP</b>	<b>A'galsangeng</b> Reconstruction, Board, Sow, Two rows <i>Awaiting Reconstruction</i>	<b>A-i-g</b> <i>Awaiting Reconstruction</i>	<b>Aasha</b> Modern Southern Asia Reconstruction, Board, Race, Escape <i>Awaiting Reconstruction</i>	
<b>Abalala's</b> Modern Eastern Africa Board, Sow, Three rows	<b>Abanga</b> Modern Eastern Africa, Middle Africa Reconstruction, Board, Sow, Two rows <i>Awaiting Reconstruction</i>	<b>Acodex (Alfonso)</b> Reconstruction, War, Chess <i>Awaiting Reconstruction</i>	<b>Acodex de los Cuatros Tiempos</b> Medieval Southern Europe, Western Europe Board, War, Chess	<b>Achi</b> Modern Western Africa Board, Space, Line	<b>Að Elta Steipur</b> Modern Western Europe Board, War <b>TODO</b>	<b>Adi</b> Modern Western Africa WinHisDLP, Sow, Two rows	<b>Adidada</b> Modern Western Africa Board, Sow, Two rows	<b>Adjiboto</b> Modern South America WinHisDLP, Sow, Two rows <b>TODO</b>	
<b>Adjito</b> Modern Western Africa Reconstruction, Board, Sow, Two rows <i>Awaiting Reconstruction</i>	<b>Adugo</b> Modern South America Board, Hunt	<b>Adzua</b> Reconstruction, Board, Space, Line <i>Awaiting Reconstruction</i>	<b>Adzus (Children)</b> Reconstruction, Board, Space, Line <i>Awaiting Reconstruction</i>	<b>Ahtarash Gutu</b> Modern Southern Asia Board, War, Leaping, Alquerque	<b>A'mé</b> <i>Awaiting Implementation</i>	<b>Aiyewetstani</b> Modern Northern America Reconstruction, Board, War, Leaping, Alquerque <i>Awaiting Reconstruction</i>	<b>Aj Sekali</b> Modern Central America WinHisDLP, Race <b>TODO HELP</b>	<b>Aj Sayil</b> Modern Central America WinHisDLP, Race <b>TODO HELP</b>	
<b>Aj Sin'anil</b> Modern Central America WinHisDLP, Race <b>TODO HELP</b>	<b>Aj T'wii</b> Modern Central America WinHisDLP, Race <b>TODO</b>	<b>Akidada</b> Modern Western Africa Board, Space, Line <i>Awaiting Reconstruction</i>	<b>Ako Okwe</b> Modern Western Africa Board, Sow, Two rows	<b>Akasayida</b> Ancient WinHisDLP, Math <b>TODO</b>	<b>Al-Qirg</b> <i>Awaiting Reconstruction</i>	<b>Alsa</b> <i>Awaiting Reconstruction</i>	<b>Alsa Evangeli</b> Medieval Northern Europe Board, War, Tafl	<b>Alser</b> Modern Western Asia Board, Sow, Two rows	
<b>Alkarhat</b> Modern Western Africa Reconstruction, Board, Space, Line <i>Awaiting Reconstruction</i>	<b>Alquerque</b> Medieval, Modern Southern Europe, Western Europe Board, War, Leaping, Alquerque	<b>Alquerque de Doze (Portugal)</b> Reconstruction, Board, War, Leaping, Alquerque <i>Awaiting Reconstruction</i>	<b>Alquerque de Nueve</b> Medieval Southern Europe, Western Europe Reconstruction, Board, Space, Line <i>Awaiting Reconstruction</i>	<b>Alquerque de Tres</b> Medieval Southern Europe, Western Europe Board, Space, Line	<b>Altan Xaracaj</b> Modern Eastern Asia, Northern Asia Board, Space, Line <i>Awaiting Reconstruction</i>	<b>American Pool Checkers</b> Board, War, Leaping, Draughts	<b>Ancestral Apache Game</b> Medieval, Modern Northern America Reconstruction, Board, Race <i>Awaiting Reconstruction</i>	<b>Andada</b> Modern Eastern Africa Board, Sow, Two rows	
<b>Andaraya</b> <i>Awaiting Reconstruction</i>	<b>Andot</b> Modern Eastern Africa, Northern Africa Board, Sow, Two rows	<b>Apit</b> Modern Southeastern Asia Reconstruction, Board, War <i>Awaiting Reconstruction</i>	<b>Aralzaa</b> Modern Eastern Asia, Northern Asia Board, Race, Fill	<b>Arb'ata 'Ashara</b> Medieval Western Asia <i>Awaiting Reconstruction</i>	<b>Aringari</b> Modern Northern Africa <i>Awaiting Reconstruction</i>	<b>Asalto</b> Board, Hunt	<b>Ashanti Alignment Game</b> Modern Western Africa <i>Awaiting Reconstruction</i>	<b>Ashanti Draughts</b> Modern Western Africa <i>Awaiting Reconstruction</i>	
<b>Ashere</b> <b>TODO</b>	<b>Ashta-kashte</b> WinHisDLP, Race <b>TODO</b>	<b>Ashtapada</b> Medieval Southern Asia Board, Race, Reach	<b>Asi Keliya</b> Modern Southern Asia WinHisDLP, Race <b>TODO</b>	<b>As-Tab wa-d-Dukk</b> Medieval, Modern Eastern Africa, Northern Africa, Western Asia Board, War	<b>Atidada</b> Western Africa <i>Awaiting Reconstruction</i>	<b>Atanbaj</b> <i>Awaiting Reconstruction</i>	<b>Aukzy</b> <i>Awaiting Reconstruction</i>	<b>Aw-ii On-nam Ot-gh</b> Modern Southeastern Asia Board, Sow, Two rows	
<b>Awagaga</b> Modern Eastern Africa, Northern Africa WinHisDLP, Sow, Two rows <b>TODO</b>	<b>Awangdu</b> Modern Western Africa Board, War oooooooooooo	<b>Awari</b> Modern South America Board, Sow, Two rows	<b>Awitlaknawe</b> Modern Northern America Board, War	<b>Awitlalan</b> Modern Northern America Board, War, Leaping	<b>Azigo</b> Modern Western Africa WinHisDLP, Sow, Two rows <b>TODO</b>	<b>Backgammon</b> Modern Northern Europe Board, Race, Escape	<b>Badami Game</b> Medieval, Modern Southern Asia Reconstruction, Board, Race <i>Awaiting Reconstruction</i>	<b>Bagh Bandi</b> Modern Southern Asia Board, Hunt	
<b>Bagh Batti</b> Modern Eastern Asia, Southern Asia Board, Hunt	<b>Bagh Bukree</b> Modern Southern Asia Reconstruction, Board, Hunt <i>Awaiting Reconstruction</i>	<b>Bagh Gutu</b> Modern Southern Asia Board, Hunt	<b>Bagha Gutu</b> Modern Southern Asia Board, Hunt	<b>Baghchal</b> Modern Eastern Asia, Northern Asia Board, Hunt	<b>Bajir</b> Modern Eastern Asia, Northern Asia Reconstruction, Board, Race, Reach <i>Awaiting Reconstruction</i>	<b>Bajr</b> Modern Eastern Asia, Northern Asia Board, Race, Fill	<b>Bakkis</b> Modern Eastern Africa <i>Awaiting Reconstruction</i>	<b>Bam Biang Bah</b> Modern Southern Asia Board, Hunt	
<b>Banyarwanda Mill Game</b> Modern Eastern Africa <i>Awaiting Reconstruction</i>	<b>Bao Ki Arabu (Zanzibar 1)</b> Modern Eastern Africa Board, Sow, Four rows	<b>Bao Ki Arabu (Zanzibar 2)</b> Modern Eastern Africa Board, Sow, Four rows	<b>Bao Kiawhili (DR Congo)</b> Modern Eastern Africa, Middle Africa WinHisDLP, Sow, Four rows <b>TODO</b>	<b>Bao Kiawhili (East Africa)</b> Modern Eastern Africa WinHisDLP, Sow, Four rows <b>TODO</b>	<b>Bao Kiawhili (East Africa)</b> Modern Eastern Africa WinHisDLP, Sow, Four rows	<b>Baqura</b> Modern Southern Asia, Western Asia Board, Sow, Two rows	<b>Bara Gutu</b> Modern Southern Asia Board, War, Leaping, Alquerque	<b>Bara Gutu (Bihar)</b> Modern Board, War, Leaping	<b>Basil</b> Reconstruction, Board, Race, Escape <i>Awaiting Reconstruction</i>



## Hnefatafl (Tafl)

[Leaderboard](#)



**Period** [Medieval](#)

**Region** [Northern America](#), [Northern Europe](#)

**Category** [Board](#), [War](#), [Tafl](#)

### Description

Hnefatafl is a Nordic game mentioned frequently in medieval texts from Scandinavia, Iceland, and the British Isles. Hnefatafl appears to be related to a range of other tafl games, in which on side has a king and a smaller number of pawns, situated in the center of the board, playing against an opponent with more pieces. The king's goal is largely thought to be to escape to one of the corners, and the opponent's goal is to capture the king.

### Rules

Boards can be 7x7 or 13x13. Two players. One side has a king piece and allied pieces, the other has uniform pieces, greater in number. The central spot on the board is marked. Can be played on intersection of lines or in the squares. Captures are made.

DLP Evidence.

### All Rulesets

**Suggested rulesets**

[Fetlar](#) Suggested reconstruction from 2007 Fetlar Hnefatafl Panel.

[Copenhagen](#) Suggested rules by A. Nielsen, A. Bartley and T. Millar in 2012.

### Origin

Scandinavia

### Ludeme Description

[Hnefatafl.lud](#)

### Concepts

Browse all concepts for Hnefatafl [here](#).

### Reference

Murray 1951: 55–64.

#### Evidence Map

22 pieces of evidence in total. Browse all evidence for Hnefatafl [here](#).

Evidence Range: 790 - 1413

Click on any marker or highlighted region to view the evidence relating to it.  
To view all regions, please select it from the category options below.

Evidence category:

Evidence coloured based on:

Map style:



#### Sources

Arbman, H. 1940. Birka I. Die Gräber. Tafeln. Uppsala: Almqvist & Wiksells Boktryckeri-Aktiebolag.

Arbman, H. 1943. Birka I. Die Gräber. Text. Uppsala: Almqvist & Wiksells Boktryckeri Aktiebolag.

Berger, F. 1998. 'Das Spielbrett auf dem Stein von Ockelbo.' *Archäologische Informationen* 21(2): 279–281.

Lund, G. 2010. *Spill i middelalderens bysamfunn. En arkeologisk analyse av spillmateriale fra Bergen. Våren: Universitetet i Bergen.*

Murray, H.J.R. 1951. *A History of Board-Games Other Than Chess.* Oxford: Clarendon Press.

Nicolaysen, N. 1882. *Langskibet fra Gokstad.* Christiania: Alb. Cammermeyer.

Rundkvist, M. and H. Williams. 2008. 'A Viking Boat Grave with Amber Gaming Pieces Excavated at Skamby, Östergötland, Sweden.' *Medieval Archeology* 52: 69–102.

Schulte, M. 2017. Board games of the Vikings— from hnefatafl to chess. *Maal og Minne*. 1–42.

Sterckx, C. 1973. 'Les trois damiers de Buckquoy (Orcades).' *Annales de Bretagne et des pays de l'Ouest* 80:675–689

Vigfusson, G and F. Powell. 1883. *Corpus Poeticum Boreale. The Poetry of the Old Northern Tongue from the Earliest Times to the Thirteenth Century. Volume I.* Oxford: Clarendon Press.

Vigfusson, G. and F. Powell. 1883a. *Corpus Poeticum Boreale. The Poetry of the Old Northern Tongue from the Earliest Times to the Thirteenth Century. Volume II.* Oxford: Clarendon Press.

#### Identifiers

DLP.Games.14

BGG.2932





ID: DLP.Evidence.821

Type: Artistic depiction

Location: 60°53'14.59"N, 16°42'56.61"E

Date: 1080-01-01 - 1099-12-31

Gender: Male

Rules: Square board with central and four corner squares marked, two players.

Content: Gs 19 Ockelbo Runestone, depicting two men holding drinking horns sitting across from each other on opposite sides of a square board with the central space and the corner spaces marked. Schulte 2017: 13–16. Date: Berger 1998: 279  
Confidence: 100



#### Evidence Map

22 pieces of evidence in total. Browse all evidence for Hnefatafl [here](#).

Evidence Range: 790 - 1413

Click on any marker or highlighted region to view the evidence relating to it.  
To view all regions, please select it from the category options below.

Evidence category:

Evidence coloured based on:

Map style:



#### Sources

Arbman, H. 1940. Birka I. Die Gräber. Tafeln. Uppsala: Almqvist & Wiksells Boktryckeri-Aktiebolag.

Arbman, H. 1943. Birka I. Die Gräber. Text. Uppsala: Almqvist & Wiksells Boktryckeri Aktiebolag.

Berger, F. 1998. 'Das Spielbrett auf dem Stein von Ockelbo.' *Archäologische Informationen* 21(2): 279–281.

Lund, G. 2010. *Spill i middelalderens bysamfunn. En arkeologisk analyse av spillmateriale fra Bergen. Våren: Universitetet i Bergen.*

Murray, H.J.R. 1951. *A History of Board-Games Other Than Chess.* Oxford: Clarendon Press.

Nicolaysen, N. 1882. *Langskibet fra Gokstad.* Christiania: Alb. Cammermeyer.

Rundkvist, M. and H. Williams. 2008. 'A Viking Boat Grave with Amber Gaming Pieces Excavated at Skamby, Östergötland, Sweden.' *Medieval Archeology* 52: 69–102.

Schulte, M. 2017. Board games of the Vikings— from hnefatafl to chess. *Maal og Minne.* 1–42.

Sterckx, C. 1973. 'Les trois damiers de Buckquoy (Orcades).' *Annales de Bretagne et des pays de l'Ouest* 80:675–689

Vigfusson, G and F. Powell. 1883. *Corpus Poeticum Boreale. The Poetry of the Old Northern Tongue from the Earliest Times to the Thirteenth Century. Volume I.* Oxford: Clarendon Press.

Vigfusson, G. and F. Powell. 1883a. *Corpus Poeticum Boreale. The Poetry of the Old Northern Tongue from the Earliest Times to the Thirteenth Century. Volume II.* Oxford: Clarendon Press.

#### Identifiers

DLP.Games.14

BGG.2932



Maastricht University



MICHAEL SCHULTE

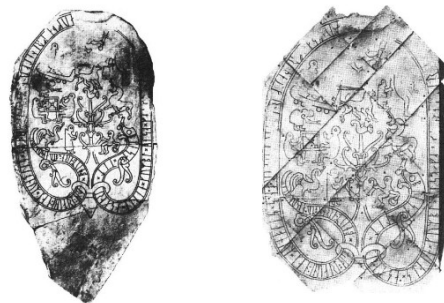


Figure 3: Ockelbo rune-stone, Gästrikland = GS 19, dating: late Viking Age (Source: K. Hj. Kempff 1887; carving reconstructed after Kempff's and Måhlén's blueprint from 1884; cf. Källström 2016: 23)

The scene in question depicts two men playing a board game and cheering to each other with a drinking horn. It has the same aura of balance and harmony as *Völuspá*, stanza 8 and 60–62. Ockelbo may be inspired by the golden gaming pieces, or belong to a related tradition, but this is hard to determine. In his discussion of the Ockelbo stone, Ploss (1966: 101) focused on the gaming scene and suggested that it might reflect a ceremonial drinking oath. As he put it, "[b]esonders gelungen ist die Spielszene am Spieltisch, die möglicherweise einen Schwurtrunk darstellt"; ['the scene at the game board, which possibly reflects a drinking oath, is particularly well-done']. I have already argued that this type of game board is typically a *hnefatafl*. There are, at any rate, abundant archaeological finds of similar boards, each of them displaying the same orthogonal symmetry with five fields marked off.

## Senet (Znt)

[Leaderboard](#)



**Period** [Ancient](#)

**Region** [Northern Africa](#), [Western Asia](#)

**Category** [Board](#), [Race](#), [Escape](#)

### Description

Senet is one of the oldest board games known in the world, documented from about 3000 BCE until the first millennium BCE in Egypt. It was also played in Cyprus for most of that time, and played at different times in the Levant. Though a full ruleset has never been found, hints from texts and tomb paintings in Egypt give us clues about the manner in which it was likely played. The game was also heavily imbued with religious significance, as the board itself represented the journey through the afterlife.

### Rules

Played on a 3x10 board. Pieces can be five or seven in number. Two players. Four casting sticks used as dice. Boustrophedon track from top left to bottom right.

### All Rulesets

#### Scholarly rulesets

[Kendall Standard rules](#) proposed by Timothy Kendall.

[Kendall Five Pieces](#) Five pieces per player.

[Kendall Starting Throw A](#) throw of 1 is required to begin.

[Kendall Trap Square 27](#) is a trap.

[Kendall Home Row](#) Cannot bear off until all pieces are beyond the home row.

[Kendall Five Pieces Starting Throw](#) Five pieces and starting throw rules.

[Kendall Five Pieces Trap](#) Five pieces and trap rules.

[Kendall Five Pieces Home Row](#) Five pieces and home row rules.

[Kendall Starting Throw Trap](#) Starting throw and trap rules.

[Kendall Starting Throw Home Row](#) Starting throw and home row rules.

[Kendall Trap Home Row](#) Trap and home row rules.

[Kendall Five Pieces Starting Throw Trap](#) Five pieces, starting throw, and trap rules.

[Kendall Starting Throw Trap Home Row](#) Starting throw, trap, and home row rules.

[Kendall Five Pieces Trap Home Row](#) Five pieces, trap, home row.

[Kendall Five Pieces Starting Throw Home Row](#) Five pieces, starting throw, home row rules.

[Kendall All Options](#) Five pieces, starting throw, trap, and home row rules.

[Piccione Rules](#) proposed by Peter Piccione.

[Jéquier Rules](#) proposed by Gustave Jéquier.

#### Reconstructed rulesets

[Simple Senet](#) Played on a board with no markings.

[Simple Marked Senet](#) Played on a board with basic markings.

[Middle Kingdom Senet](#) Played on a board common in Middle Kingdom Egypt.

[Early New Kingdom Senet](#) Played on a board common in earlier New Kingdom Egypt.

[Late New Kingdom Senet](#) Played on a board common in later New Kingdom Egypt.

[Vertical Senet](#) Played with a vertically-oriented board and different markings.

[Double Senet](#) Played on two boards placed next to each other.

[Cypriot Senet](#) Played on simple boards with seeds or stones in prehistoric Cyprus.

#### Suggested rulesets

[Bell Suggested Rules](#) from R. C. Bell.

### Origin

[Egypt](#)

## Other Rulesets

### Scholarly rulesets

[Kendall](#) Standard rules proposed by Timothy Kendall.

[Kendall Five Pieces](#) Five pieces per player.

[Kendall Starting Throw](#) A throw of 1 is required to begin.

[Kendall Trap](#) Square 27 is a trap.

[Kendall Home Row](#) Cannot bear off until all pieces are beyond the home row.

[Kendall Five Pieces Starting Throw](#) Five pieces and starting throw rules.

[Kendall Five Pieces Trap](#) Five pieces and trap rules.

[Kendall Five Pieces Home Row](#) Five pieces and home row rules.

[Kendall Starting Throw Trap](#) Starting throw and trap rules.

[Kendall Starting Throw Home Row](#) Starting throw and home row rules.

[Kendall Trap Home Row](#) Trap and home row rules.

[Kendall Five Pieces Starting Throw Trap](#) Five pieces, starting throw, and trap rules.

[Kendall Starting Throw Trap Home Row](#) Starting throw, trap, and home row rules.

[Kendall Five Pieces Trap Home Row](#) Five pieces, trap, home row.

[Kendall Five Pieces Starting Throw Home Row](#) Five pieces, starting throw, home row rules.

[Kendall All Options](#) Five pieces, starting throw, trap, and home row rules.

[Piccione](#) Rules proposed by Peter Piccione.

[Jéquier](#) Rules proposed by Gustave Jéquier.

### Reconstructed rulesets

[Simple Senet](#) Played on a board with no markings.

[Middle Kingdom Senet](#) Played on a board common in Middle Kingdom Egypt.

[Early New Kingdom Senet](#) Played on a board common in earlier New Kingdom Egypt.

[Late New Kingdom Senet](#) Played on a board common in later New Kingdom Egypt.

[Vertical Senet](#) Played with a vertically-oriented board and different markings.

[Double Senet](#) Played on two boards placed next to each other.

[Cypriot Senet](#) Played on simple boards with seeds or stones in prehistoric Cyprus.

### Suggested rulesets

[Bell](#) Suggested Rules from R. C. Bell.

**Senet** (*Znt*)  
**Ruleset:** Early New Kingdom Senet



**Game**

See the game [Senet](#) for more details.

**Period(s)**

Ancient

**Region(s)**

Northern Africa

**Summary**

Played on a board common in earlier New Kingdom Egypt.

**Rules**

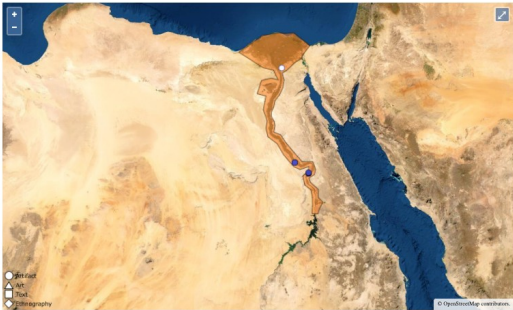
Played on a 3x10 grid with markings in the following squares: 26: neferu hieroglyph 27: water hieroglyph 28: 3 birds 29: 2 men.

**Concepts**

Browse all concepts for Early New Kingdom Senet [here](#).

**Reference**

Future reconstruction.



**Sources**

Carter, H and A.C. Mace. 1933. The Tomb of Tut-Ankh-Amen. Cairo: Cassell & Co.

Crist, W. 2016. Games of thrones: board games and social complexity in Bronze Age Cyprus. Unpublished Ph.D. dissertation, Arizona State University.

Decker, W. 1987. Sport und Spiel im alten Ägypten. Munich: Verlag C.H. Beck.

Deveria, T. 1897. Les jeux de dames en Égypte. In G. Maspero (ed.), Mémoires et Fragments II. Bibliothèque Égyptologique 5. Paris, 83–96.

Iskander, J.N. 2010. 'A recently discovered senet-board from Heliopolis.' Mitteilungen des Deutsches Archäologischen Instituts, Abteilung Kairo 66: 122–129.

Kendall, T. 1978. Passing through the Netherworld: The Meaning and Play of Senet, an Ancient Egyptian Funerary Game. Belmont, MA: Kirk Game Company.

Leemans, C. 1846–1850. Monuments égyptiens du Musée d'antiquités des Pays-Bas à Leide, Tome II. Leiden: Brill.

MacGregor, W. 1922. Catalogue of the MacGregor Collection of Egyptian Antiquities. Sotheby Sale Catalog 1922. London: Dryden Press.

Maspero, G. 1883. Guide du visiteur au Musée de Boulaq, Boulaq: Musée de Boulaq.

Nash, W. 1902. Ancient Egyptian draughts-boards and draughts-men. Proceedings of the Society of Biblical Archaeology 24(December): 341–348.

Needler, W. 1953. A thirty-square draught board in the Royal Ontario Museum. Journal of Egyptian Archaeology 39: 60–75.

Piccione, P. 1984. 'Review of Das Senet-Brettspiel im alten Ägypten.' Journal of Egyptian Archaeology 70: 172–180.

Piccione, P. 1990. The Historical Development of the Game of Senet and its significance for Egyptian Religion. Unpublished Phd Thesis, University of Chicago.

Pieper, M. 1909. Das Brettspiel der alten Ägypter. Berlin: Weidmannsche Buchhandlung.

Pierret, P. 1878. Recueil d'inscriptions inédites du Musée égyptien du Louvre. Études égyptologiques 8. Paris: F. Vieweg.

Pusch, E. 1979. Das Senet-Brettspiel im Alten Ägypten. Munich: Deutsche Kunstverlag.

Randall-McIver, D. And A.C. Mace. 1902. El Amrah and Abydos 1899–1901. EM 23. London: Egypt Exploration Fund.

Romano, I, W. Tait, C. Bisulca, P. Creasman, G. Hodgins, and T. Wazny. 2018. An Ancient Egyptian senet board in the Arizona State Museum. Zeitschrift für Ägyptische Sprache und Altertumskunde 145(1): 71–85.

Schiaparelli, E. 1927. Relazione sui lavori della missione archeologica Italiana in Egitto II. Turin.

Tait, W. 1982. Game-boxes and Accessories from the Tomb of Tutankhamun. Oxford: Griffiths Institute.

Wallis, H. 1898. Egyptian Ceramic Art: The MacGregor Collection. London: Taylor & Francis.





## Senet (Znt)

Ruleset: Kendall



### Game

See the game [Senet](#) for more details.

### Summary

Standard rules proposed by Timothy Kendall.

### Description

These rules were compiled by Timothy Kendall for his commercially-sold version of Senet.

### Rules

Seven pieces per player, which begin on the board, alternating spaces from white to black along the track. Four throwing sticks, marked on one side and blank on the other, used as dice. The values of the throws are equal to the number of blank sides up, when no blank sides are up the throw = 5. Throws of 1, 4, and 5 grant the player another throw. All throws are made before moving, and a piece must move the full value of one throw at a time. Players alternate turns throwing the sticks, and the first one to throw 1 plays as white and moves the white piece in front. When a piece lands on a space occupied by the opponent's piece, the opponent's piece is sent back to the space where the piece that captured it moved from. When a player has two or more pieces in consecutive spaces, these pieces cannot be sent backward in this way. If a player cannot use a throw to move a piece forward, it must be used to move a piece backward. If a backward move makes a player's piece land on a space occupied by a piece belonging to the opponent, the opponent's piece is sent to the place where the player's move began. If a player cannot move, the turn ends. Spaces 26-30 provide special rules allowing the player to bear off. To move beyond square 26, the player must first land on it with an exact throw. From there, the player may: bear off with a throw of 5; move to square 30 with a throw of 4 and bear off on any subsequent throw; move to square 29 with a throw of 3, but it must stay there until borne off with a throw of 2; move to square 28 with a throw of 2, but it must stay there until borne off with a throw of 3. Pieces in squares 28 and 29 are never required to move backward and bearing off is not required from any space. When a player lands on squares 28-30 and an opponent's piece is already there, the opponent's piece is sent to square 27 instead of 26. When a piece is in square 27, whether by being sent there as described above or by being forced to use a throw of 1 to move into square 27, the player may either move the piece back to square 15 and lose one turn, or may leave the piece in square 27 until a 4 is thrown, bearing the piece off. A player cannot move any other piece on the board when one remains in square 27 or 15 after being sent back to it, and pieces which normally would be protected from being sent back because they are next to each other may now be sent back. Pieces in squares 28-30 are safe as long as a piece is in square 27. The player in square 27 may decide to give up trying to throw a 4 on any turn and move this piece back to square 15 and lose their next turn. The first player to successfully bear off all their pieces wins.

### Concepts

Browse all concepts for Kendall [here](#).

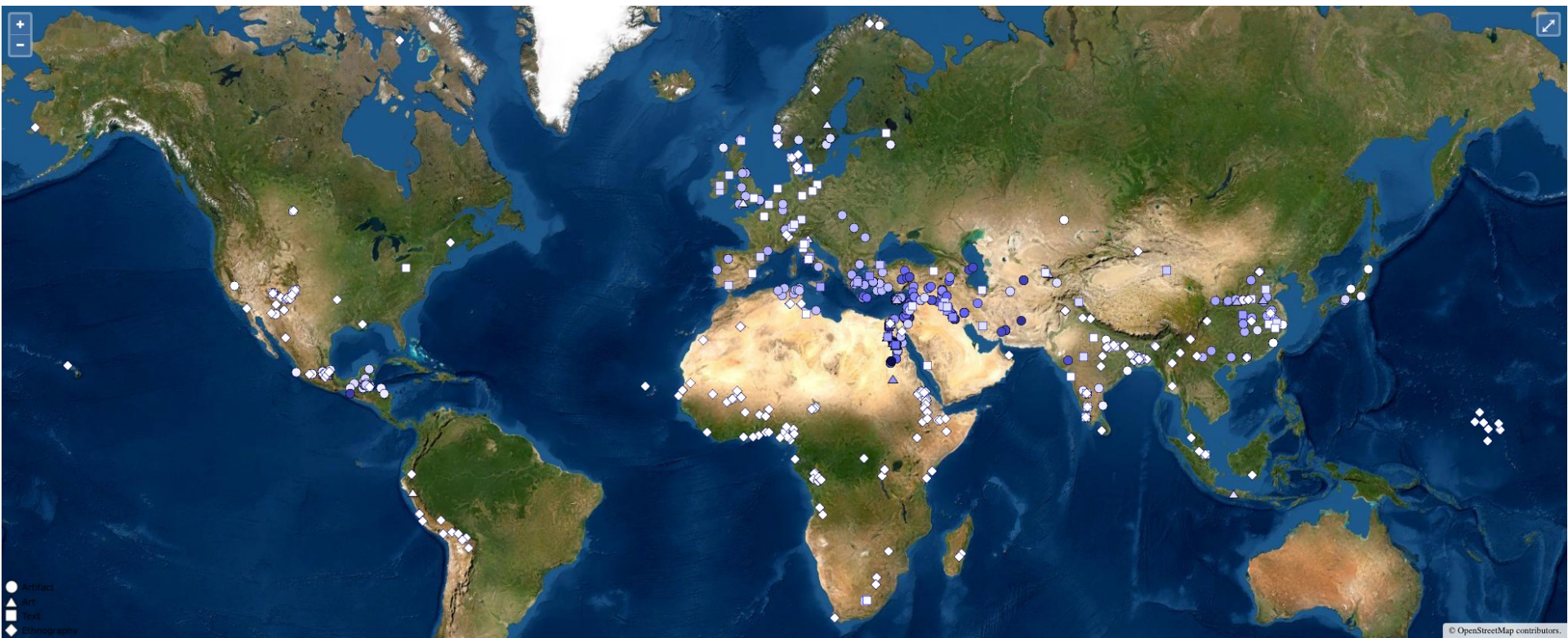
### Reference

Kendall 1979: rules book










































































































# Game Reconstruction

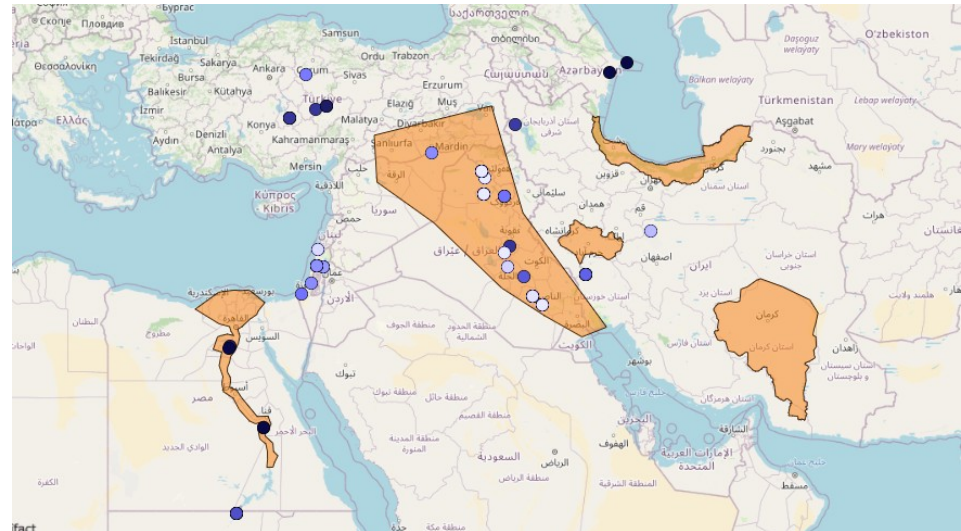
- A large portion of the games in our database have incomplete rules.
- Use the evidence within our database as the basis for reconstruction.

12-Ring	33 Circles	A'gatacangeng	Aasha	Abanga	Acedrex (Alfonso)	Adito	Adzu	Adzu (Children)	Ajwastatani	Albarhat	Alquerque de Doze (Portugal)	Alquerque de Nueve	Ancestral Apache Game	Apit
														
Badami Game	Bagh Bukree	Baji	Baral	Barjays	Bem Mancala Game	Bhutanese Game	Borobudur Game	Bräspel	Buga Ndohi	Cashepana	Cashan Ghems	Chandraki	Chanukha Game	Chattranga (Paryupans)
														
Che Lo	Cheng Fang Cheng Long	Chu Shogi	Chuki	Chungani	Coptic Game	Dablu (Large)	Dablu (Small)	Dai Shogi	Damat	Damli	Dasapada	Davaz Zirge (Type 1)	Davaz Zirge (Type 2)	Dholo
														
Dinwar	Dodekapello	Dris et-Tessa	Dris et-Tessa (Diagonals)	Edris a Jin	El-Mahana Game	Elven-Fang	Fetach	Fortresse	Four-Fang	Ga	Gabatta	Gala (Chess Variant)	Garnacha (Nobility)	Go (Tibet)
														
Harekul (Horsens)	Heian Dai Shogi	Heian Sho Shogi	Hopi Game	Huaini	Hun-Ta-Quee-Cha-Ka	Hulu Wen	Iji Buga	Ish Buga	Ishaba	Isinren	Iz Buga	Kanga	Kilende	Kiwit Oyun
														
Krida Buddhibalsrita	Kuang	Lay Gwet Kyah	Le Jeu de Genitarnes et de Voler	Le Jeu du Lièvre	Len Saké	Lilolo	Lombard Chess	Long Assize	Lothal Game	Lu Qi	Lupo e Picore	Mak Khom	Maka Dai Dai Shogi	Mandiant
														
Mandoli	Mangpur Capturing Game	Matara Game	Mbangi	Mbanga Alignment Game	Medieval Gabots	Medieval Schach	Mn	Mongolian Chess	Mont's Tying Kyung To	Moraha	Muthungum	Nagajunkonda Game	Nardist	Nichay
														
Nigla	Ngulungu	Nyēngē	O Shogi (Futuo Shodo-Shu)	O Shogi	Ohola	Ouri	Ovalru	Owana	Owasit	Pachiz	Patarya	Pancha (Mahabharata with Double Loop)	Pancha (Mahabharata with Loop)	Pancha (Mahabharata)
														
Pancha Kaliya (Complex)	Panjikant Game	Pasang	Patoli (Aditi)	Plaf	Picaria (Large)	Popond Game	Qirg	Quechuarque	Rao	Riga	Riga Game	Roman Merels	Roman Small Merels	Rongmei Naga Alignment Game
														
Rongmei Naga Capturing Game	Rongmei Naga Hunt Game	Sal	Sakio	Samantay	Sagara Game	Scachs	Schuster	Selayar Game	Senup	Settith	Seven Fang	Shen	Shakhmaty	Shatranj (Algeria)
														
Shatranj (Egypt)	Shatranj (Iraq)	Shatranj al-Jawarihya	Shatranj al-Kubr (Constantinople)	Short Assize	Sig (Dugache)	Sig (Rehman)	Siga (Senegal)	Sith	Skak	Solfario	Spana	Sua Qin Gnuu	Sugoroku	Tabal
														
Tablo	Tai Shogi	Tahn Buga	Tams	Taylana	Tawla	Terjiku Shogi	The Concentration Game	To Kynigi Iou Lagou	Toccatello	Totolopi (Cross-Shaped)	Totolopi (Round)	Totolopi (War)	Tricrac	Tshaki
														
Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction	Waiting Reconstruction

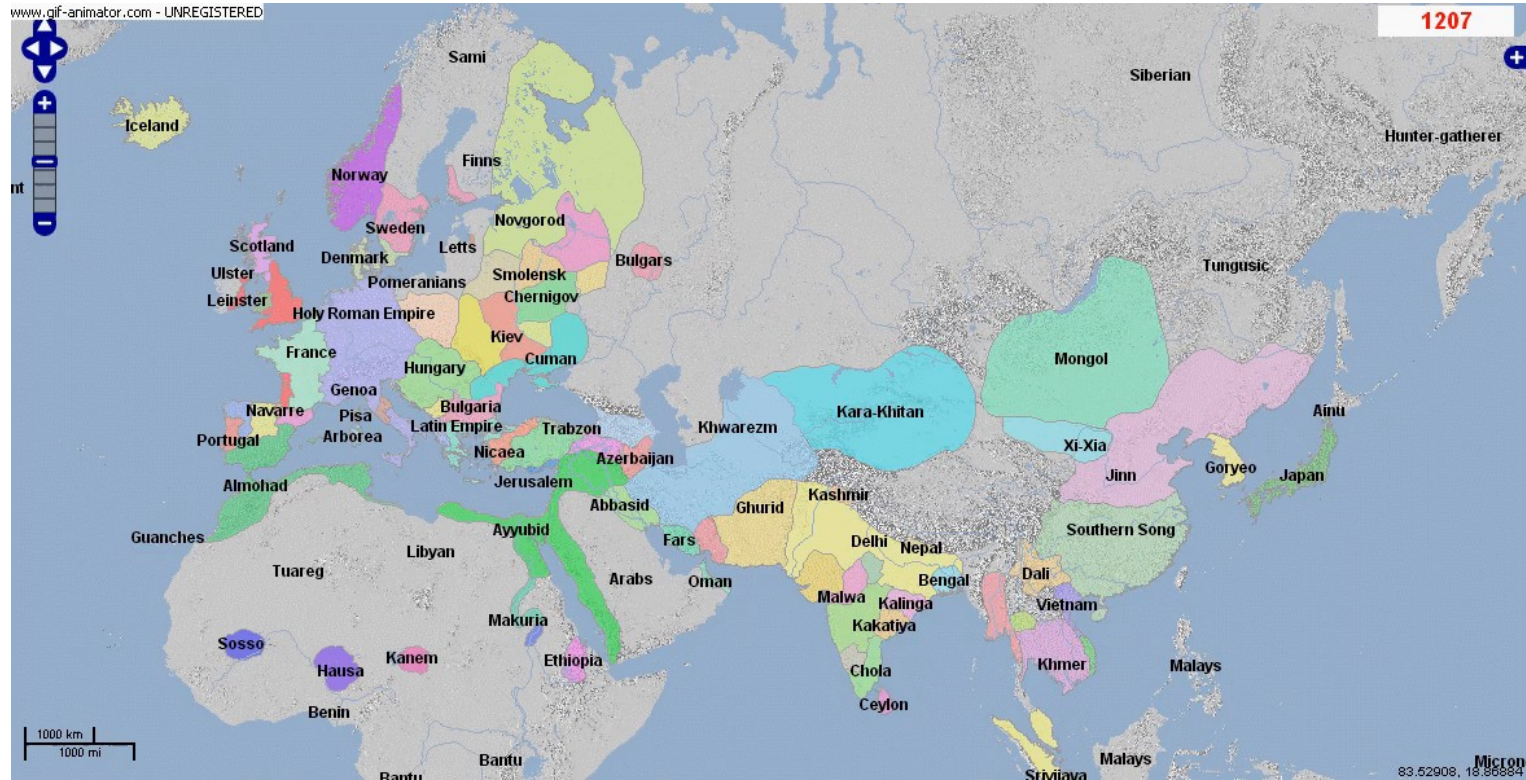
# Evidence Profiles

- Create an Evidence profile for each game.
- Describes the dates and locations where it was played.

58 Holes  
(2200 – 301 BCE)



# Geacron (geo-political social network)





# Hypothesis

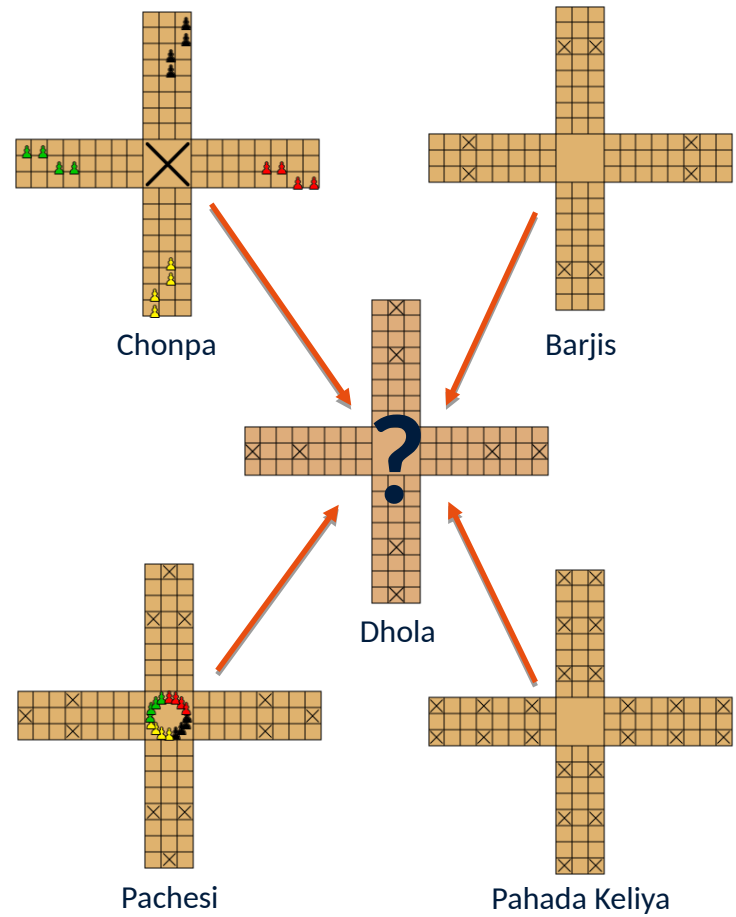
- Games which are closer are more likely to share concepts.
  - Equipment
  - Rules
  - Gameplay
- When reconstructing games, we can take inspiration from other nearby games.





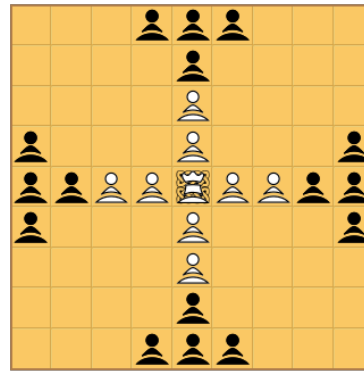
# Example #1

- Dhola (~1883CE)
- Pachisi-style board design.
- Probably shared many concepts/rules with other nearby games.

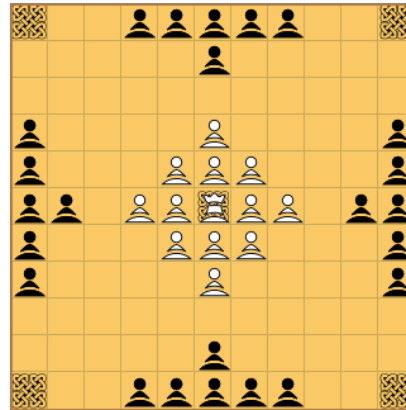


## Example #2

- Use rules of Tablut as a basis for reconstructing other Tafl games.
- Similar time and place.
- Similar board design.
- Probably similar rules.



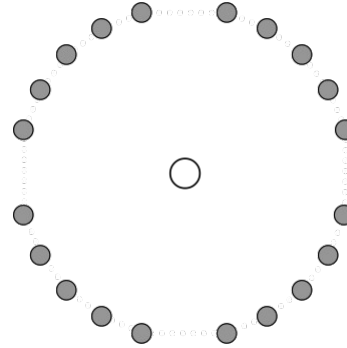
Tablut (1732CE)



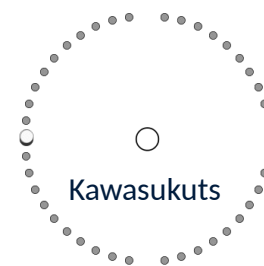
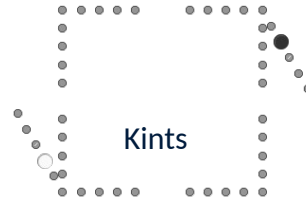
Hnefatafl (790 - 1413CE)

# Example #3

- Apache game based on archaeological evidence.
- All known games with a similar board used dice.
- Highly likely that this game also used dice.



Ancestral Apache Game (1280 - 1580CE)



# What do you think?

- Game network expected later this year.
- Currently developing a library of game concepts.
- We would love to hear your opinions and ideas!

- ▼ 1 **Properties**: General properties of the game.
  - ▼ 1.1 **Format**: Format of the game.
    - ▼ 1.1.1 **Time**: Time model.
      - 1.1.1.1 **Discrete**: Players move at discrete intervals.
      - 1.1.1.2 **Realtime**: Moves not discrete.
    - ▼ 1.1.2 **Turns**: Player turns.
      - 1.1.2.1 **Alternating**: Players take turns moving.
      - 1.1.2.2 **Simultaneous**: Players can move at the same time.
    - 1.1.3 **Stochastic**: Game involves chance elements.
    - 1.1.4 **Hidden Information**: Game involves hidden information.
    - 1.1.5 **Match**: Match game.
    - ▼ 1.1.6 **Asymmetric**: Asymmetry in rules and/or forces.
      - ▼ 1.1.6.1 **Asymmetric Rules**: Players have different rules.
        - 1.1.6.1.1 **Asymmetric Play Rules**: Players have different play rules.
        - 1.1.6.1.2 **Asymmetric End Rules**: Players have different end rules.
      - ▼ 1.1.6.2 **Asymmetric Forces**: Players have different forces.
        - 1.1.6.2.1 **Asymmetric Setup**: Different starting positions for each player.
        - 1.1.6.2.2 **Asymmetric Pieces Type**: Different piece types owned by each player.
  - ▼ 1.2 **Players**: Players of the game.
    - ▼ 1.2.1 **Num Players**: Number of players.
      - 1.2.1.1 **Simulation**: No players (environment runs the game).
      - 1.2.1.2 **Solitaire**: Single player.
      - 1.2.1.3 **Two Player**: Two players.
      - 1.2.1.4 **Multiplayer**: More than two players.
    - ▼ 1.3 **Cooperation**: Players have to cooperate.
      - 1.3.1 **Team**: Game involves teams of players.
      - 1.3.2 **Coalition**: Players may form coalitions.
    - ▼ 1.4 **Puzzle**: Type of puzzle.
      - 1.4.1 **Deduction Puzzle**: Solution can be deduced.
      - 1.4.2 **Planning Puzzle**: Solution is reached in moving pieces.
  - ▼ 2 **Equipment**: Equipment for playing the game.
    - ▼ 2.1 **Container**: Containers that hold components.
      - ▼ 2.1.1 **Board**: Board shared by player for playing the game.
        - ▼ 2.1.1.1 **Shape**: The shape of the board.
          - 2.1.1.1.1 **Square Shape**: Square shape.
          - 2.1.1.1.2 **Hex Shape**: Hexagonal shape.
          - 2.1.1.1.3 **Triangle Shape**: Triangle shape.
          - 2.1.1.1.4 **Diamond Shape**: Diamond shape.
          - 2.1.1.1.5 **Rectangle Shape**: Rectangle shape.
          - 2.1.1.1.6 **Spiral Shape**: Spirale shape.
          - 2.1.1.1.7 **Circle Shape**: Circle shape.

# Thank you!

- Merci beaucoup to the conference organizers!
- Download Ludii and play at [ludii.games/download](https://ludii.games/download)
- Browse our database of 1000 traditional games at [ludii.games/library](https://ludii.games/library)
- Read more about the Digital Ludeme Project at [ludeme.eu](https://ludeme.eu)
- Suggest games/evidence to us! [walter.crist@maastrichtuniversity.nl](mailto:walter.crist@maastrichtuniversity.nl)
- For technical questions contact us at [ludii.games@gmail.com](mailto:ludii.games@gmail.com)
- Follow us on Twitter: [@archaeoludology](https://twitter.com/archaeoludology), [@LudiiGames](https://twitter.com/LudiiGames)
- Thanks to Cameron Browne and team members Éric Piette, Dennis J. N. J. Soemers.
- This project is funded by the European Research Council (ERC Consolidator Grant #771292).

