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Adriaan de Groot [📄](#)

Adrianus Dingeman (Adriaan) de Groot, (October 26, 1914 - August 14, 2006), was a Dutch [psychologist](#) and chess master, who conducted a number of ground-breaking experiments in the [cognitive](#) processes that occur in the [brains](#) of strong chess players. The studies involve participants of all chess backgrounds, from amateurs to masters. They investigate the cognitive requirements and the thought processes involved in moving a chess piece. The participants were usually required to solve a given chess problem correctly under the supervision of an experimenter and represent their thought-processes vocally so that they could be recorded.

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Quotes

Chase & Simon

[William Chase](#) and [Herbert Simon](#) in [Perception in chess](#), 1973 ^[2]

The most extensive work to date on perception in chess is that done by De Groot. In his search for differences between masters and weaker players, de Groot was unable to find any gross differences in the statistics of their thought processes: the number of moves considered, search heuristics, depth of search, and so on. Masters search through about the same number of possibilities as weaker players-perhaps even fewer, almost certainly not more-but they are very good at coming up with the "right" moves for further consideration, whereas weaker players spend considerable time analyzing the consequences of bad moves.

De Groot did, however, find an intriguing difference between masters and weaker players in his short-term memory experiments. Masters showed a remarkable ability to reconstruct a chess position almost perfectly after viewing it for only 5 sec. There was a sharp drop off in this ability for players below the master level. This result could not be attributed to the masters' generally superior memory ability, for when chess positions were constructed by placing the same numbers of pieces randomly on the board, the masters could then do no better in reconstructing them than weaker players. Hence, the masters appear to be constrained by the same severe short-term memory limits as everyone else, and their superior performance with "meaningful" positions must lie in their ability to perceive structure in such positions and encode them in chunks.

Fernand Gobet

[Fernand Gobet](#) in *Adriaan de Groot: Marriage of two Passions*, 2006 ^[3], two excerpts :

Through the intervention of his friend [Max Euwe](#), de Groot managed to convince, among others, most of the [AVRO](#) players to participate in his experiments. Chess giants such as [Alekhine](#), Euwe, [Fine](#), [Flohr](#), and [Keres](#) agreed to act as subjects. Some of the experiments - for example, the one with [Tartakover](#) - were run on the steamer carrying the players to the [1939 Olympiads in Argentina](#). The protocols are

reproduced in the English edition of de Groot's thesis and, apart from their scientific value, are great fun for chess aficionados to read.

...

De Groot proposed also that a player's thinking process may be divided into four main phases: orientation, exploration, investigation, and proof. In the orientation phase, players collect relevant information and try to form a first (tentative) judgment of the position. During the exploration phase, sample variations are analysed, and, typically, the number of critical moves or plans is reduced to two. The two candidate moves are analysed in great detail during the investigation phase, which is characterised by a more in-depth search than during the exploration phase. Players strive to validate their favourite move (or plan). Note that most of the argumentation used by chess players consists of convincing themselves that one of the two variations is better than the other. Finally, the proof phase is used to recapitulate the information obtained in the analysis and to check the correctness of the argumentation.

Four Stages

De Groot defined four stages of the thought process:

1. The **orientation phase** – grasp the position and formulate general ideas of what to do.
2. The **exploration phase** – analysis of concrete variations.
3. The **investigation phase** – choice of a probable best move.
4. The **proof phase** – confirming the validity of the choice reached in phase three.

His Ph.D. Thesis *Het denken van den Schaker* ^[4] was already cited in [Claude Shannon's](#) paper ^[5]. In "Thought and Choice in Chess", 1965, De Groot introduced [iterative](#) or progressive deepening. His book became the bible for chess programmers in the late sixties during the zenith of the [Type B](#) programs.

Euratom

An AI-effort in [machine translation](#) and on developing a computer chess program in the "human style" was conducted under the auspices of [Euratom](#) agency in the 60s in the spirit of its President [Étienne Hirsch](#) and a team around [Max Euwe](#), [Adriaan de Groot](#), [François Lionnais](#), [Claude Berge](#) and [Marcel Barzin](#) ^[6]: Finally an important international team had been gathered around [Max Euwe](#) (former world champion) to work on the problem of the simulation of the play of the failures. One found there the encyclopedist [François Lionnais](#), the mathematician [Claude Berge](#), the logician [Barzin](#)

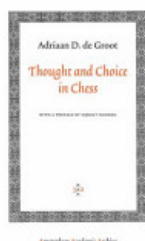
, the psychologist [De Groot](#). This team made considerably progress on the problems of the mediums of part, but did not have the possibility of carrying out a program of a complete set.

See also

- [Cognition](#)
- [Perception in Chess](#)
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- [Psychology](#)
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Selected Publications

- [Adriaan de Groot](#) (1946). *Het denken van den Schaker, een experimenteel-psychologische studie*. Ph.D. thesis, [University of Amsterdam](#), advisor [Géza Révész](#); N.V. Noord-Hollandse Uitgevers Maatschappij, [Amsterdam](#). Translated with the help of [George Baylor](#), with additions, (in 1965) as *Thought and Choice in Chess*. Mouton Publishers, The Hague. ISBN 90-279-7914-6.
- [Adriaan de Groot](#) (1965, 1978). *Thought and Choice in Chess*. Mouton & Co Publishers, The Hague, The Netherlands. ISBN 90-279-7914-6, [amazon](#), [google](#)



- [Adriaan de Groot](#) (1966). *Perception and Memory versus Thought: Some Old Ideas and Recent Findings. Problem Solving: Research, Method, and Theory*. (ed. B. Kleinmuntz), pp. 19-50. John Wiley, New York.
- [Adriaan de Groot](#), [Walter R. Reitman](#) (eds.) (1966). *Heuristic Processes in Thinking*. International Congress of Psychology, [Nauka](#), [Moscow](#)
- [Adriaan de Groot](#) (1986). *Intuition in Chess*. [ICCA Journal, Vol. 9, No. 2](#)
- [Adriaan de Groot](#) (1987). *Some Benefits of Advances in Computer Chess*. [ICCA Journal, Vol. 10, No. 2](#)
- [Adriaan de Groot](#) (1988). *A Rejoinder to I.J. Good's Comments*. [ICCA Journal, Vol. 11, Nos. 2/3](#) ^[7]
- [Adriaan de Groot](#) (1989). *Some Special Benefits of Advances in Computer Chess*. [Advances in Computer Chess 5](#)
- [Adriaan de Groot](#) (1992). [Allen Newell](#): *An Adieu*. [ICCA Journal, Vol. 15, No. 3](#)
- [Adriaan de Groot](#), [Fernand Gobet](#) (1996). *Perception and Memory in Chess: Heuristics of the professional eye*. Van Gorcum and Comp. B.V., Assen, The Netherlands. ISBN 90-232-2949-5. Chapter 9; A discussion: Two authors, two different views? available as [word reprint](#).

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- ## References

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