Elements
of
Positional Evaluation

How the Pieces
Get Their Power

Dan Heisman

Fourth Edition
Revised and Enlarged

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Dedication

To "Coach" Donald Byrne

"A chessplayer's chessplayer and a friend's friend."

– part of a telegram from then World Chess Champion Robert J. (Bobby) Fischer to International Master Donald Byrne at Byrne's testimonial dinner in Boalsburg, Pennsylvania, September 7, 1974, shortly before Byrne passed away at an early age as a result of a rare disease that cut short not only his life, but a very promising chess career. We'll never forget you, Coach!

Preface

Elements of Positional Evaluation: How Chess Pieces Get Their Power provides a different perspective on how to evaluate the effectiveness of chess pieces and positions.

Originally written in 1974 on the author's typewriter, this new, greatly expanded fourth edition of *Elements* includes material comparing this current edition of *Elements* with 1974 positional chess theory. It also includes new discussions on how 2009 theory has moved ever closer to the ideas suggested in *Elements*.

In addition, over 100 new examples and diagrams have been added plus an Appendix of Illustrative Games, making *Elements* less of a work on theory and more about theory and practice.

I hope my work in greatly enhancing *Elements* has also enhanced its instructive value and enjoyment for readers.

Dan Heisman
January 2010

Introduction

The fourth edition of *Elements of Positional Evaluation* presents a new challenge to the author: how to position a book whose first edition was written in 1974 about the inadequacies of positional theory at that time, and make it relevant to readers in 2009?

The challenge is more daunting because the suggested improvements to 1974 theory have, to a great extent, become reality, so 2009 theory is much more aligned with the ideas in *Elements*.

One possibility would have been to ignore the changes in theory that have occurred since 1974 and simply leave the book the way it was: compare the proposed theory to "current" theory as if 2009 theory was very similar to that of 1974. This would be the easiest approach, and superficially reasonable; the first three editions of the book sold out – why change a good thing?

However, I agree with my publisher that taking the easy way out is not only incorrect, but overlooks an opportunity to do more for the reader. Therefore, this edition will take a different approach by adding a theme: occasional discussion/examples of how theory has changed between 1974 and 2009 and how that change brings 2009 theory closer to my proposed theory.

The other substantive revision in *Elements* will be the addition of many new examples, which will make this expanded edition less of a purely theoretical work than the first three editions, and more practical.

After analytical skill, the next most important chess skill is evaluation. For positions, this means answering the questions: *Which side stands better? How much better?* and *Why?*

Breaking positional evaluation down into its elemental parts requires an answer to the question *How much is that piece worth in this position?*

Most chessplayers rely on loosely knit, unstructured methods to evaluate positions and the role of the pieces therein. They learn positional principles (i.e., guidelines/heuristics/rules of thumb) that often lead to inaccurate evaluations.

A similar problem occurs when chess programmers quantify evaluations in the form of a "scoring function." In the early days of computer chess, programs relying heavily on evaluation played worse than those using primarily "brute force look-ahead." Hopefully, this book will provide a step towards overcoming some of these difficulties.

Introduction

This introduction lays the foundation for a new evaluation theory and provides an overview of the book's organization. We will attempt to show why a new theory is necessary, revolutionary, and novel. Not all of the points made in this book are original; some of the novelty will be highlighted by the systematic way the material is organized and presented.

Hopefully, the new theory will give a better understanding of the nature of the game and should help many readers significantly improve their playing strength. Bertrand Russell wrote:

> But when theories change, the alteration usually has only a small effect so far as observable phenomena are concerned. The practical difference between Einstein's theory of gravitation and Newton's is very minute, even though the theoretical difference is very great. Moreover, in every new theory there are some parts that seem pretty certain, while others remain very speculative.

Chess knowledge is not the same as chess ability. Moreover, positional knowledge is separate from analytical and tactical ability, which are the predominating factors in a player's overall chess strength. There is no substitute for analytical and tactical competence. Because *Elements* is about positional theory, absorbing its material will not directly enhance most players' analytical ability, but should greatly benefit their positional awareness.

We will attempt to show that the evaluation theory of 1974 needed to be enhanced. We will not only present the new theory, but also prove the deficiencies of the 1974 theory and sprinkle discussion of how 2009 theory more closely follows the new. Many examples will be provided to help illustrate these points.

Before we start, it would be helpful to discuss revolution – scientific revolution. Thomas S. Kuhn's book *The Structure of Scientific Revolutions* explained the process of how scientific theories evolve. The following is a short synopsis of Kuhn's *Structure*:

In any scientific discipline that deals with unknown, difficult-to-perceive, or inexact phenomena, there exists a certain *status quo* that is accepted by most authorities. This *status quo* is a theory or set of theories that attempts to explain observed phenomena and tries to predict future occurrences. Examples include: the structure of the universe, molecular theory, origins of the earth, origins of life, and how physical phenomena occur. In general physics, the well known theories that came to be widely accepted were formed by Aristotle, then Newton, and finally Einstein. There were other rejected theories, and the eventually accepted theories were not accepted immediately by the originator's peers. Some theories may take centuries before they are generally accepted by specialists in the field.

The general pattern is as follows:

First, there exists an accepted theory that is believed by most of the specialists in a field. This theory has a certain "track record" for explaining and predicting phenomena. As this theory begins to fail, various reasons are given by its adherents to explain these exceptions. This pattern of theory breakdown continues until several things happen. First, the exceptions pile up until they get unwieldy. Then, various new revolutionaries analyze these unsatisfactory results and use them to construct assorted new theories (called paradigms). Each paradigm attempts to better explain existing phenomena and more accurately predict future results. Slowly, the old theory collapses. The revolution continues as the experts in this field devise experiments and tests to help them determine which new theory, if any, is acceptable. Finally, sometimes dramatically, the experts gravitate toward one theory, which becomes the new *status quo*. Most scientific theory is formed this way.

Therefore, "scientifically," the tasks for this book are clear: first, present 1974 theory on positional evaluation; second, show how it is inadequate; third, devise a new theory and, finally, prove that the new theory is superior to the old. To accomplish this final task, the author must prove that the new theory explains existing phenomena (observations) with fewer, if any, exceptions.

These tasks parallel this book's structure. There are seven chapters, in the same order as the steps outlined above. The Introduction and Chapter 1, "The Background of Positional Knowledge," explain the 1974 theory, attempt to show its inadequacy, and forges onward toward 2009 theory. Chapters 2 and 3, "The Real Elements" and "Pseudo Elements," show the basis of the new theory. Chapters 4 and 5, "The Pieces and the Elements" and "Static Features and the Elements," solidify the new theory, show how it relates to 1974 theory, and compare the adequacy of the new and old theories. Chapter 5 also serves with Chapter 6, "Miscellaneous Applications of the Theory," to take some of the previous stratagems of existing "dogma" and looks at them in a new light. Finally, Chapter 7, "Epilogue," attempts to solidify the case by summarizing the process, and also presents a final argument in favor of the new theory.

The following are highly credible sources who believed that 1974 theory had too many exceptions.

In his book on Petrosian,[1] P. H. Clarke responds to a surprise move with this perceptive annotation:

> This magnificent reply must have come as a rude shock to White. After all, it seems to flout a basic law of positional play. But these laws are not so much to be obeyed as interpreted; and it is the interpretations given by the great masters that ensure the continuing evolution of chess.

In A. D. de Groot's remarkable scientific work, *Thought and Choice in Chess*, the Dutch psychologist reinforces the premises of this book many times when he shows how chess talent is developed.[2]

> In the chess master's empirical, specifically inductive way of thinking there are no primary principles from which deductions can be made; nor are there any empirical rules without exceptions. Often a plan or board goal must be given up right after the opponent moves: if shifting to another plan is more 'advantageous.' A dogmatist is just as unfit for playing chess as he is for leading a dynamic enterprise. The chess master is of necessity a relativist or even, so to speak, an opportunist in his thinking.

Later de Groot talks about a player's individual perception of these rules:

> What actually happens is best illustrated by looking at playing methods. First, by means of playing experiences and/or textbooks the player gets to know certain important general strategic and tactical rules; next, he learns to recognize and to handle exceptions to these rules – which in their turn grow into new, more refined rules with new exceptions, etc. Finally, the player develops a "feeling" for the cases in which these already highly specialized rules can be applied... A player develops a feeling for those cases where there are winning chances and for the ways in which such chances must be exploited. In this manner the player's ability to classify and to apply appropriate treatment (in terms of thinking and playing methods) is steadily refined.

De Groot also makes an insightful comment about why chess is more a sport and less a science[3]:

> There was a time when what we now call the scientific conception of chess did not yet exist. Largely as a result of the work of Wilhelm Steinitz (1836-1900) – and not before – chess began to develop so-called scientific traits ... He was the first to connect strategic planning with a systematic position investigation in terms of the features of the position ... It would be a mistake to suppose that the new school was enthusiastically received by everybody ... Nowadays, nearly 70 years later, a battle no longer rages around the theory of Steinitz. In a general sense it has been completely accepted: in a modernized and much more elaborated form it is part of the technical knowledge that every chess master is assumed to possess.
>
> Nonetheless, the game of chess has not become a science ... Of course, the quest for the objectively best move is relevant during the thought process – it is known that some grandmasters like Tarrasch, Euwe, and Botvinnik maintain a pronouncedly objective "scientific" attitude towards the choice-of-the-move problem during the game – but the point is that

> only rarely can the problem be objectively solved. Even when the choice-of-move problem turns out to be objectively solvable in analysis, the time limit and the prescribed fixedness of the pieces on the board make it impossible for the player to attain more than an incomplete proof in a normal match or tournament game. In spite of what laymen may think, Alfred Brinckmann is right when he says “In the chess battle, acting carries more weight than cognition.”

Russian grandmaster Alexei Suetin speaks up against the current set of rules as they apply to the opening:[4]

> ... the opening struggle is very complicated and cannot be entirely subjected to general rules ... . It must be emphasized that the dynamism of chess is not an arbitrary, chance process of change, but on the contrary, is subjected to the iron logic of chess. The positional and the material factors are continually transformed during the course of the game, from it first moves onwards.

Another interesting feature of *Elements* is its application to the art of chess teaching, which had long been a neglected area of chess research in the U.S. before the immigration of many fine instructors from the former Soviet Union. The following is excerpted (and edited) from “The Basis of Positional Chess Teaching,” which I wrote in the early 1970s:[5]

> Have you ever thought about why and when a player’s rating levels off? Was it just lack of talent or did time and ambition enter the picture? I feel that these factors lie within the individual. But there is one aspect that can be controlled externally: the fundamental way that a person learns how to play; that is, the order he learns his chess skills and the priority (and emphasis) he puts on various aspects of these skills. Furthermore, the overwhelming majority of players attempt to improve in a haphazard manner, using a hodgepodge of learning techniques.
>
> Why is this? How can this best be remedied? In short, how does a player get rid of the dogma that can so easily hinder progress? It is not easy to do this if you scoff at aid or considers yourself to be “of sufficient strength.” Most players do not follow suggestions until they are burned by practical experience. That is normal so long as they don’t repeatedly make the same mistakes. Only the very gifted seem to learn by avoiding mistakes instead of making them.
>
> This leads to the question, “What is the correct method?” A player interested in improvement draws, and enlarges upon, his and other’s experiences. I have drawn upon my experiences to form the basis of my theory of teaching.

Introduction

Elements was originally quite a maverick book, rejected by two publishers back in the 1970s. After the first edition was published in the 1990s, someone on the internet called it a "Cult Classic." However, I am happy to say that by 1998 not only was *Elements* enjoying its third edition, but the theory proposed herein was – not so much because of this work, but because the bases are sound – becoming more generally accepted.

In 1998, IM John Watson's magnificent book on similar (and other) subjects, *Secrets of Modern Chess Strategy*, was voted the outstanding chess book of that year. At that time I corresponded with John, discussing the similarities of the theory in our books, and have since appeared as a guest on his ICC Chess.fm radio show. While he had no knowledge of *Elements* when writing his book, I am happy to say that *Secrets of Modern Chess Strategy* is more than a justification and extension. In my opinion, *Secrets* and its excellent sequel, *Modern Chess Strategy in Action,* can also serve as further praxis for many ideas in *Elements*!

To conclude the introduction, I would like to whet the reader's appetite with a bit of the proposed new theory.

Static features are factors based upon where the pieces are situated on the board. *Dynamic* features are based upon analysis; i.e., mentally moving the pieces. This book addresses how static features affect the value of the pieces in a given position. For example, *if doubled pawns (a static feature) are often harmful, but are sometimes beneficial, then there must be something more basic than doubled pawns on which one could/should base his positional evaluation* – something that will help one determine when doubled pawns are good or bad and by how much. These more basic "somethings," when found and identified, will then become our elements.

It is also important to differentiate the evaluation of each piece individually in a given position from the evaluation of an entire position. This book is more about the static evaluation of each piece's value rather than the evaluation of an overall position. However, the new theory can also help evaluate entire positions by providing insight into: *Who stands better*, *By how much*; and *Why*? To this point, one of the proposed elements, coordination, implies the involvement of multiple pieces.

Students who wish to study evaluation usually concentrate on static features such as pawn structures, files, holes, outposts, all of which have been considered the most basic positional ideas. The identification of more basic elements should help the reader achieve a better understanding of evaluation. A discussion of these elements begins in Chapter 2.

Chapter 5: Static Features and the Elements

5.1 Introduction

Static features, first introduced in Section 1.3, are those that can be determined by looking at the position without analysis. In this chapter we will continue to examine static features, this time with the aid of the elements.

Static features usually – but not always – are evaluated without the use of dynamic elements, especially time. Static feature evaluation does not change based upon whose move it is, but of course the overall position evaluation almost always does. Static features do change every time an irreversible (castling, capturing, or pawn) move is made.

Chess, as a finite, full information game, should include concepts that enable you to evaluate the position, i.e., answer the questions, "Who stands better, by how much, and why?"[43] – given who is to move, of course. It is one of our goals to show that evaluation of a position (excluding tactics; i.e., who stands "positionally better") based on *static* features alone is insufficient for this purpose.

In 1974 many chess theoreticians agreed that evaluation theory, based upon static concepts alone, had an almost endless series of exceptions and even exceptions to the exceptions. In this chapter we will re-examine 1974 theory (as first introduced in Section 1.3) in light of the new theory (and add some observations about how these ideas are viewed in 2009). Then, hopefully, the reader should be able to decide that:

> (1) The new theory leads to a more profound understanding of chess, even if used only as a "lower level" basis for static theory; or
>
> (2) The new theory has inherently fewer exceptions than 1974 theory.

If either is true, then the new theory can be used as a basis for new works involving chess application and annotation.

One consequence of accepting the deficiency of 1974's static theory is that statics can no longer be used as a *complete* positional teaching package. Too often serious students mistakenly use misleading shortcuts in their thought process, stunting their development. It is insufficient to think, "I have a doubled pawn; that is weak. Therefore, all else being equal, I am losing ..." Such a thought process *may* be perfectly correct in a given position. However, a consequence of the new theory is to identify aspects of the doubled pawns that represent the weakness, not the "doubleness" itself.

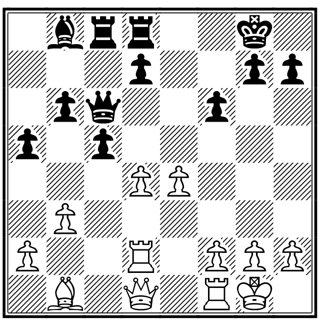
5.2 Static Features and the Pawns

A beginner can make a big mistake by being overly concerned about static theory.

More than once in my teaching career, I have watched a student abstain from winning a pawn. When I later inquired as to why they did not take the pawn, they would reply "Because if I took it, it would give me an isolated (or doubled or backward) pawn." They would not win the pawn because it would make one of their own pawns weak and that pawn later might be lost! They feared they would increase their own pawns' vulnerability. Indeed, there *are* many cases where winning a pawn can result in acquiring multiple liabilities that are worth more than one pawn, and tactical as well as positional considerations would make it unwise to win the pawn. However, in the overwhelming majority of cases any weakness caused by the win of a pawn would be minor compared to the value of an extra pawn.

Similarly, students often *lose* a pawn unnecessarily for minor static reasons.

For example, consider the following:



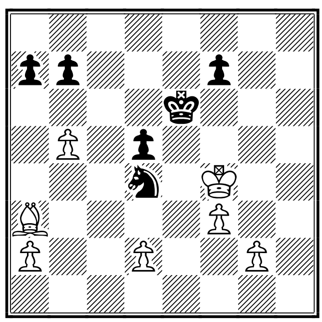
White to play

White plays **1.d×c5**. Which way should Black recapture?

If Black plays 1...♕×c5?, then White plays 2.♖×d7, winning a pawn. So Black should play **1...b×c5**, allowing the queen to continue protecting the d-pawn. Yet, in a very similar position, a student played 1...♕×c5?, because "I didn't want to get an isolated pawn on the a-file." When the author analyzed the position, I never got so far as to consider the isolated pawn; I did not seriously take into account *any* static feature once I realized I had only one way of recapturing without losing a pawn and thus considered 1...b×c5 to be forced.

The student's thought process is a good example of letting statics dominate basic safety concerns. He is misapplying static "tiebreak criteria" to an analytical, non-tiebreak position.

However, in many situations my students were faced with a simple position, where the win of the pawn only made the capturing pawn weaker (such as becoming doubled) and possibly subject to tactical threats. Sometimes these threats could put pressure on the pawn, often to the extent that the extra pawn might be lost, although that loss usually could not be foretold for certain.



White to play

White, faced with the loss of the b-pawn, decides to push it and get the most disruption possible with **1.b6**. However, many weaker players, when put in Black's position and faced with the choice between 1...a6 or 1...a×b6, usually choose to push past to avoid the doubled isolated pawns. However, *it is much better to just capture the pawn* with **1...a×b6**. Although Black has doubled isolated pawns, *a pawn is a pawn, and the extra material is more than enough compensation for any static problems*.

In most cases, valuing minor static considerations over clear material gain is illogical. No matter how weak a single pawn is, it almost certainly has more value than one that is not there at worst, you will lose back the pawn, *at the cost of one capturing tempo* to the opponent and the weakness will be gone! It is true that to win the pawn in the first place, you spend that extra tempo but, again, that means that at worst, your opponent would spend a tempo to get the pawn back later. Not only that, but if you *could* easily hold the pawn (often the case), then surely you have gained some advantages, since the vulnerability of a pawn can rarely add up to more than it's worth. For another example, see move 13 in the Ruy Lopez Exchange Variation, near the end of the next section, 5.2.1, "Doubled Pawns."

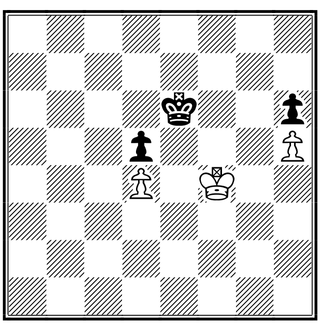
We are *not* implying that all wins of pawns are tactically or positionally correct, but that if the *only* weakness incurred is in the static form of the extra pawn's own vulnerability, then to refrain from such a capture may not be justifiable. This idea is a basic statement of what I have come to call "The Principle of Tactical Dominance," and I wrote a *Novice Nook* article (http://chesscafe.com/text/heisman57.pdf) on this theme.

The extreme fear of the static weakness is more likely to occur to a player brought up in the "doubled pawns are bad" school. This does not imply that a player properly educated under the old principles will invariably make such mistakes, but only that it is through misguided training (or reading) that such ideas can exist at all – and most older players, including the author, if brought up under any system at all, were taught the 1974 static feature model.

Before considering the various types of pawns, let us review some basic aspects of pawn movement:

(1) The inflexibility of pawn movement is best shown by its irreversibility – meaning the weaknesses that are created are often permanent.

(2) Pawns are sometimes best studied in terms of their groupings, such as the "mobile pawn majority," "minority attacks," and "pawn islands." *A pawn island is a connected group of friendly pawns separated from other friendly pawns by one or more files.* Both players start out with one united pawn island. But as play continues and pawns capture or are captured, smaller islands are created and more pawn islands emerge. A pawn island can be as small as one pawn. If a player has only two pawns, both isolated, he has two pawn islands



Each side has two pawn islands.