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What looms large in this changing perspective seems to be the continuity of deduction, abduction, and induction in human inquiry as a seamless dynamic process. Human inquiry as a combination of analysis and synthesis seems a nice framework in which the indefinite sequence of abduction, deduction, and induction must find its place. The same point might be also expressed in terms of the economy of research. In any inquiry, we start from an abduction as hypothesis generation. Then, we proceed by reducing our question to some background knowledge or more fundamental questions. In the former case, if successful, we have deduction. In the latter, at least we can have abduction as hypothesis selection (or inference to the best explanation). Induction or test is the last resort in this sequence of inquiries. From this perspective, van Fraassen's famous criticisms against the inference to the best explanation would seem almost pointless. For example, with full understanding that we have only a bad lot we would have to (and be willing to) launch abductive reasoning or inference to the best explanation.

This line of thought clearly indicates many other Peircean themes in our comparative study of Baduk and science in general, including the comparison of Baduk circle and the scientific community, the definition of truth in Baduk and science, and the analogical reasoning in Baduk and science. But it is obviously beyond the scope of this article to speculate on any of these themes.

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we may emphasize one rather than the other depending upon the different field and context, these seem to be inseparably intertwined. Then, are they really identical but formally distinct?

As Hintikka points out, abduction and inference to the best explanation are frequently lumped together in recent philosophical discussions. Even though I am quite impressed and almost persuaded by Hintikka's arguments for the thesis that abduction cannot be inference to the best explanation (Hintikka(1998), esp. 506–511), I tend to believe that there might be also some very good reasons why they are frequently equated. As a consequence, I am wondering whether it is possible to claim that the relationship between abduction and the inference to the best explanation is analogous to the relationship between abduction and sequence dissection in Baduk.

By now, it is widely known that the later Peirce rejected his earlier contrast of deduction, abduction, and induction in terms of his celebrated example of bean bag. (CP 2.623, 1878) Starting from CP 5.189(1903)¹¹⁾, for example, Kapitan tried skillfully to reconstruct the logical form(s) of abductive inference, i.e., (F2), (F3), (F4) and (F5).¹²⁾ Indeed, all these possible forms of abduction deserve careful analysis and in depth discussion. I think, however, Kapitan is still preoccupied with the unnecessary compulsion to identify abduction in terms of the logical form betrayed at the level of premise–conclusion argument. If it is necessary, why doesn't he complete the contrast of deduction, abduction, and induction by reconstructing the logical form of induction? What exactly changed in Peirce's mind should be fathomed in somewhat different perspective or in somewhat different level. For example, in Paavola's contrast of Peirce's earlier and later views as that of abduction as evidencing process and abduction as a methodological viewpoint seems more promising. (Paavola(2005), p. 132f.)

11) The surprising favr, C, is observed:

But if A were true, C would be a matter of course,
Hence, there is reason to suspect that A is true.
(CP 5.189)

12) Kapitan(1997), pp. 480–488.

(1983), 906)

In the last section, I wanted to pin down the exact relationship between abduction and thought experiment(i.e., sequence dissection) in Baduk. Now, I would like to suggest that the relationship between them is analogous to the relationship between deduction and reduction in syllogisms. Sequence dissection must be a process for studying relationships among different sequences resulting in one and the same shape. On the other hand, abduction in Baduk is an inference or a method of inference resulting in an interesting move. Sequence dissection is itself a sequence of sequences of moves. On the other hand, abduction in Baduk is just a move in a sequence of moves. In an Aristotelian natural deduction system, deduction depends on a relevant reduction, insofar as reduction reveals by what rules of inferences should be employed in deduction. In an important sense, then abduction in Baduk depends on a relevant sequence dissection. For sequence dissection provides us with at least some good reasons why a certain move suggested by abduction deserves further serious considerations.

6. Abduction and Inference to the Best Explanation

Recently, computer scientists and AI researchers emphasize the potential role of Baduk as a test for their studies. Johnson's New York Times article entitled "To Test a Powerful Computer, Play an Ancient Game" aptly summarizes such a trend. (Johnson(1997) By assimilating creative and rational moves in Baduk to abduction and thought experiment, I tried to contribute a bit to this intriguing interdisciplinary research on human creativity and rationality. Let me conclude with a few abductive suggestions regarding further inquiries on abduction and thought experiment in Baduk.

Whether it be in Baduk or in science or in any intellectual field, there seems to be a tension between abduction as instinct(or impulse or intuition) and abduction as inference. This might be at the same time a tension between hypothesis generation and hypothesis selection. Though

premise.” (Corcoran(1983)¹⁰, 906)

Though some valid arguments reduce to invalid, as Corcoran points out, and as Aristotle noticed, “invalid arguments reduce only to invalid and, therefore, any reduction ending with an obviously valid argument must have started with a valid argument, thus providing a mark of validity”. (Corcoran(1983), 906)

In order to make Corcoran’s points clear, let us take Bramantip (i.e. aai-4) as an example, and present both reduction and deduction visually.

(Reduction)

(1) Apm	(2) Ams	(3) Ams
Ams	Apm	Apm
?Isp	?Isp	?Aps

(Deduction)

1. Apm
2. Ams
- ? Isp
3. Aps (2,1, Barbara)
4. Isp (3, conversion by limitation)

QED

(1) is reduced to (2) by changing the order of the premises, and (2) is reduced to (3) by strengthening the conclusion based on conversion by limitation. Please note that, as Corcoran points out, in reduction we have an argument–sequence, while in deduction we have a sentence–sequence. As Corcoran emphasizes, “reduction is not a method of inference but rather a process for studying relationships among syllogisms (cf. 29b26), an *almost* totally separate enterprise”. (Corcoran

10) This is an abstract of his paper “Deduction and Reduction: Two Proof-theoretic Processes in *Prior Analytics I*” presented to a meeting of Association of Symbolic Logic on 29 December, 1981 at Philadelphia.

Fortunately, we can present examples of abduction in Baduk that must be based on sequence dissection. In Diagram 6, we can see a novel move in Black 11. Interestingly, the shape in Diagram 6 is exactly the same as that in Diagram 7. In Diagram 7, however, we can easily criticize White 10 as vulgar. If so, the sequence shown in Diagram 6 is not bad for Black. Thanks to this sequence dissection, Ishida was able to try the novel move of Black 11 in the actual game reported in Diagram 6.⁹⁾

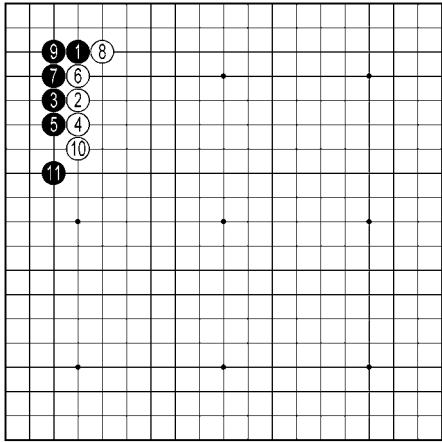
Professional players of Baduk spend much time and energy for discovering new pattern (定石) in the opening phase of the game. And, we have just witnessed that in the emergence of some new patterns sequence dissection play a crucial role. Insofar as we can count Ishida's new move of Black 11 in Diagram 6 as an instance of abduction, we have reason to consider whether abduction in Baduk depends on sequence dissection as a kind of thought experiment.

5. The Analogy of Sequence Dissection in Baduk and Reduction in Syllogistic

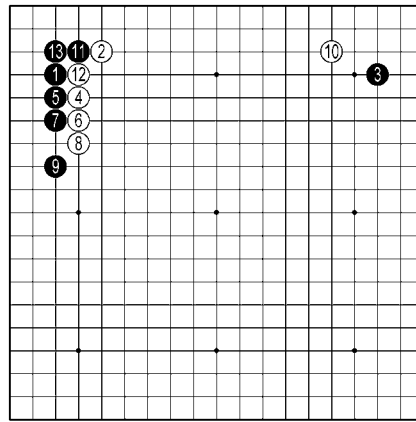
Although the distinction between deduction and reduction is clear in Aristotle's work, as John Corcoran claims, they have not been contrasted by commentators. According to Corcoran,

“A *deduction* of a conclusion from a premise set is a *sentence*-sequence constructed by chaining simple inferences to show that the conclusion is implied by the premise set. A *reduction* is an *argument*-sequence wherein each argument after the first is constructed from the previous one by “weakening” the premise set, by “strengthening” the conclusion, or by “contraposition,” i.e., replacing one premise with the contradictory of the conclusion and taking as the new conclusion the contradictory of the replaced

9) Cf. Ishida(1977), Vol. 1, p. 157. According to Ishida, he played the new move “on impulse”. But he immediately refers to the hypothetical reasoning on Black's pincer and White's correct response.



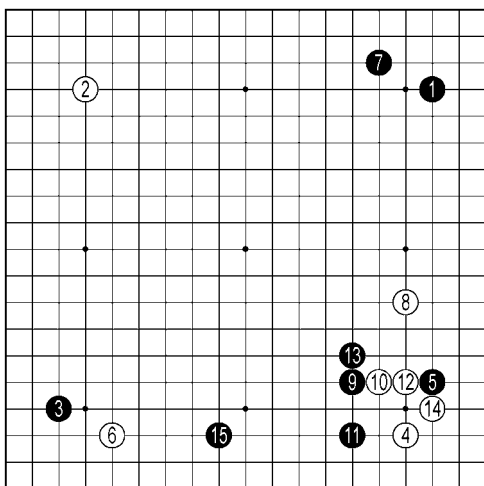
(Diagram 4)



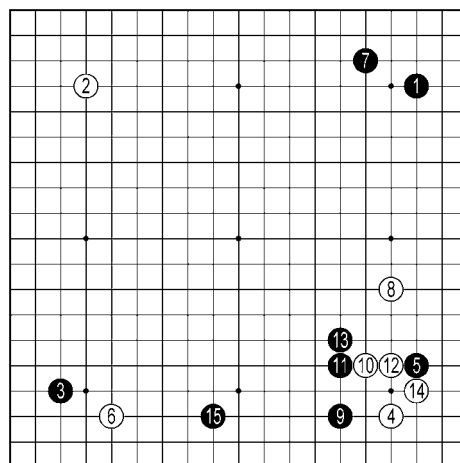
(Diagram 5)

4. Abduction and Sequence Dissection in Baduk

So far we have seen that both abduction and thought experiment based on sequence dissection are ubiquitously found in Baduk. But a crucial question is whether they are related in some meaningful ways. For, unless there is some such relationship, the alleged cases of abduction would lose much of their inferential character.

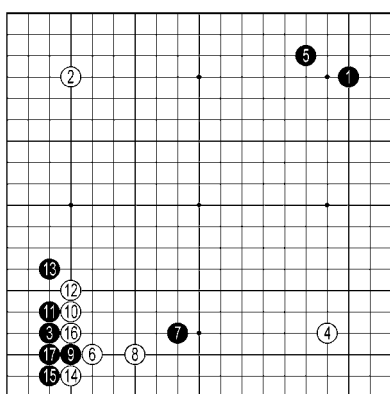


(Diagram 6)

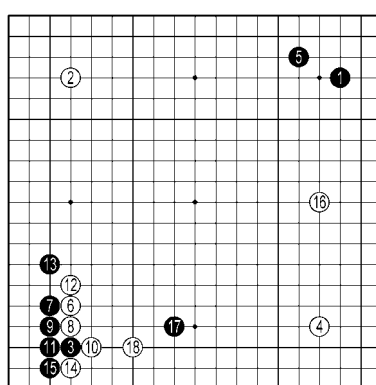


(Diagram 7)

it seems natural to look for thought experiments in Baduk. Indeed, Baduk players must perform thought experiments in every phase of an actual game or of an imaginary game analysis. What I would like to emphasize here is what Baduk players call sequence dissection (수나누기; 手割), which is a technique so widely used in their thought experiments. According to Professor Chihyung Nam, it is “a way of analyzing the relative efficiency of plays”.⁸⁾



(Diagram 2)



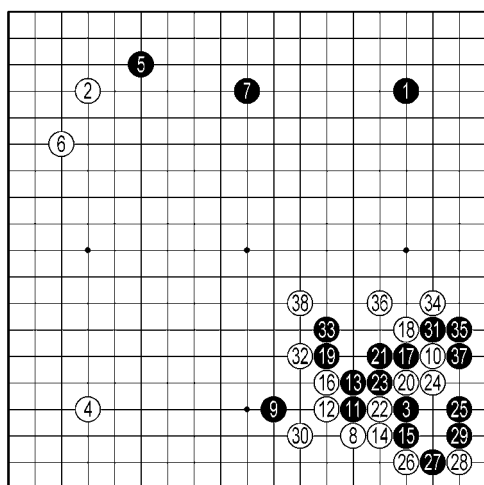
(Diagram 3)

At this stage, some examples would be helpful for understanding how sequence dissection works. In Diagram 2, we can see a typical pattern, which is assessed by professional players to be somewhat favorable to the White. According to their account based on sequence dissection, that pattern has exactly the same shape as another sequence shown in Diagram 3, in which Black’s final move is troublesome.

Another example is the same shape shown in Diagram 4 and Diagram 5. In Diagram 5, we can see that Black is too much preoccupied with the corner. For that reason, we can understand the sequence represented in Diagram 4 must be unfavorable to Black.

8) She further explains that “the process is, first to take away an equal number of stones of both colors from a position. Then evaluate whether the remaining stones are working efficiently, in order to decide which side made the better moves. Secondly, the order of plays is inverted, to see whether one would still have played in the same way so the actual position results. This reveals something about the actual value of the moves played. Nam (2004), p. 204; Dr. Moon defines it as “a method to verify the efficiency of the plays by the comparison of the shapes, in which the order of the plays are ignored”. (Moon (1998), p. 81)

the opening phase of a Baduk game. Master Cho praises White's moves 1 and 3 (discovered by Master Lee Chang Ho(이창호)⁷⁾) so much as revealing ingenious instinct or intuition. According to him, they cannot be discovered without free and creative imaginative power. In answering to Kwang Goo Lee's probing question as to what (reasoning or intuition) made it possible for Master Lee to figure out those moves, Master Cho answers that W1 was found by *positing W3 first rather than the other way around*.



(Diagram 1)

I think that there is certain ambiguity left in Master Cho's remarks. Are W1 and W3 results of intuition or inference? Be that as it may, I hope that this example is sufficient enough to demonstrate that there are potential examples of abduction in Baduk, and that they deserve careful analyses. For those who are not convinced, I may refer to some of the well known cases of the emergence of new moves and new patterns in Baduk. In fact, we may even find and interpret some creative moves in beginner's moves as exemplifying abductive reasoning.

3. Sequence Dissection in Baduk as Thought Experiment

Since Baduk is frequently counted as a strategic simulation game,

Kwang Goo Lee, who is a famous Baduk critic.

7) Master Lee is a legendary Baduk Master, who has dominated the international Baduk circle for the last fifteen years.

ongoing controversy as to whether abduction is inference to the best explanation, however, it is by no means clear what abduction is. If not a scandal, it must be the most serious open problem in epistemology, as Hintikka aptly suggested.²⁾

This situation seems partly due to the lack of clear examples of abduction in history of science, though there have been highly suggestive case studies of the abductive reasoning, including Peirce's own example of Kepler.³⁾ So, I propose to look for better (and more) examples of abduction in an oriental board game called Baduk(바둑; Go(棋); Weichi(圍棋)). For, at the most crucial stages in any game, Baduk players delve into a sophisticated reasoning that is neither deductive nor inductive. It may not be a mere coincidence that Peirce himself was an expert in chess.⁴⁾ As recent Peirce scholarship has unearthed game theoretic, dialogic, interrogative, and strategic aspects of his thought⁵⁾, it seems a timely project to analyze abductive reasoning in Baduk. I shall show how to interpret Baduk players abductive reasoning as based on the so-called sequence dissection technique. (section 2, 3, and 4) Then, this technique will be assimilated to the proof theoretic procedure of reduction (contradistinction to deduction) in Aristotle's logical theory. (section 5) Insofar as sequence dissections can shed light on abductive reasoning in Baduk, I shall argue, we may improve our understanding of scientific abduction and inference to the best explanation at the same time. (section 6)

2. Abduction in Baduk

Now, I would like to introduce a potential example of abduction in Baduk by referring to a book entitled *Dialogues with Cho Hoon Hyun* (조훈현).⁶⁾ In Diagram 1, we have an interesting imaginary situation in

2) Hintikka(1998), 503. Psillos(1996), (1997), Ladyman, Douven, Horsten, and van Fraassen(1997), Niiniluoto(1999), Okasha(2000), Minnameier(2004) are some of the most salient examples involved in this controversy.

3) Cf. Hanson(1965), Kleiner(1983), and Myrstad(2004).

4) According to Robin(1994), Peirce even annotated some chess games.

5) Pietarinen(2006) seems to be a culmination of a research tradition of Jaakko Hintikka and Gabriel Sandu.

6) Cho and Lee(1999). This book consists of a series of dialogues between Master Hoon Hyun Cho, who was the champion of the first international Go Olympic(Ing's Cup), and

Abduction and Thought Experiment in Baduk¹⁾

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(Abstract)

In view of the ongoing controversy as to whether abduction is inference to the best explanation, it is by no means clear what abduction is. This situation seems partly due to the lack of clear examples of abduction in history of science. So, I propose to look for better examples of abduction in an oriental board game called Baduk(Go; Weichi). For, at the most crucial stages in the game, Baduk players delve into a sophisticated reasoning that is neither deductive nor inductive. As recent Peirce scholarship has unearthed game theoretic, dialogic, interrogative, and strategic aspects of his thought, it seems a timely project to analyze abductive reasoning in Baduk. I shall show how to interpret Baduk players' abductive reasoning as based on the so-called sequence dissection technique. Then, this technique will be assimilated to the proof theoretic procedure of reduction (contradistinction to deduction) in Aristotle's logical theory. Insofar as sequence dissections can shed light on abductive reasoning in Baduk, I shall argue, we may improve our understanding of scientific abduction at the same time.

1. Introduction

There is no doubt that Peirce provided us with an extremely fruitful perspective by introducing abduction. Nor is it disputed that great advance has been made in our understanding of abduction. In view of the

1) Some of my earlier thoughts on abduction and thought experiments in Baduk were published in Park(2002), which failed to clarify the relationship between them. The focus of this renewed attempt must be on clarifying that relationship. See also Park(2004) and Park(2005).