

Fanti Rovetta, Francesco

Framing deceptive dynamics in terms of abductive cognition

Pro-Fil. 2020, vol. 21, iss. 1, pp. 1-10

ISSN 1212-9097 (online)

Stable URL (DOI): <https://doi.org/10.5817/pf20-1-2043>

Stable URL (handle): <https://hdl.handle.net/11222.digilib/142692>

Access Date: 16. 02. 2024

Version: 20220831

Terms of use: Digital Library of the Faculty of Arts, Masaryk University provides access to digitized documents strictly for personal use, unless otherwise specified.

FRAMING DECEPTIVE DYNAMICS IN TERMS OF ABDUCTIVE COGNITION

FRANCESCO FANTI ROVETTA

Ca' Foscari University of Venice, Italy, francesco.fantirovetta@gmail.com

RESEARCH PAPER ▪ SUBMITTED: 14/2/2020 ▪ ACCEPTED: 27/4/2020

Abstract: I propose an analysis of deception as the activity of intentionally misleading other agents' hypothetical inferences. Understanding deception in this way has the advantages of clarifying the epistemological and cognitive dynamics involved in deception. Indeed, if deception can be framed as the intentional manipulation of others' hypothetical inferences so that they will accept the false or disadvantageous hypotheses, then a better understanding of the epistemological and cognitive dynamics involved in deception will emerge by clarifying how abduction works. Tracing it back to Peirce's analysis, I will focus on recent perspectives on abduction, which stress the inherent strategic character of abductive cognition and offer a realistic description of the reasoners' capabilities and their scant resources, both internal (computational power) and external (time and information available). To support and substantiate my thesis, I will examine psychological analyses of military deception. I will conclude by remarking the advantages of the thesis here presented to better understand the epistemological dynamics of deception and by highlighting the questions it leaves open for further investigations.

Keywords: abductive reasoning; hypothetical reasoning; deception; counterdeception; intelligence analysis; Peirce

Introduction

The philosophical literature on lying and deception of the past 50 years has focused on definitory and moral issues (Mahon 2018). Much less attention has been devoted to the epistemological analysis. Here, the focus is shifted from the analysis of the conditions for a communicative interchange to count as lying to the epistemological and cognitive factor involved in deception. The central argument I will advance is that deception can be understood from an epistemological standpoint as the activity of directing other agents' hypothetical reasoning. Indeed, lying and deception are often defined in relation to a change in the degree of beliefs of other agents (Marsili 2018). Hypotheses then can be considered as graded beliefs, which are operationalised, i.e. pragmatically assumed as true in absence of better alternatives and in the face of situational pressure.

The article develops as follows: in the next section I briefly survey Peirce's along with some of the contemporary views regarding abductive reasoning which focus on its strategic nature, to show some of its features and characteristics. In section two, I relate abductive or hypothetical reasoning to deception by introducing the theorisation of deception by

psychologist of intelligence analysis, R. Heuer and military strategist, B. Whaley in order to show the perks such approach offers in terms of clarification of deceptive dynamics. By turning the attention to the relation between deception and hypothetical reasoning in military setting, I consider some elements related to hypothetical reasoning that can foster deception. Quite interestingly, there seems to have been more researches on this relation done by military strategist and psychologists of intelligence analysis than by philosophers and epistemologists. Finally, I will present a case study from the Burma campaign during WWII that will serve to show the explanatory potentialities of the framework. I will conclude by remarking the advantages of the thesis here presented to better understand the epistemological dynamics of deception and by highlighting the questions it leaves open for further investigations.

The contextual and strategic nature of hypothetical reasoning

What exactly is abduction? Abduction is a form of reasoning involving the making of a hypothesis: a hypothesis is the result of an abduction. The first Peircean formulation is in a syllogistic framework, identifying abduction as a fallacy: namely the fallacy of affirming the consequent. The fallacy has two premises and a conclusion, it can be seen as the modification of Modus Ponens, in which the minor premise is the consequent instead of the antecedent of the implication, namely:

- 1) $A \rightarrow B$
- 2) B
-
- 3) A

It is clear that judging it by means of deductive criteria (i.e. truth preservation) this inference is a fallacy: the conclusion does not necessarily follow from the premises, therefore it is not necessarily true, given that the premises are true. On the other hand, abduction is ampliative, it can expand or revise our knowledge, and it furnishes us new insights. Without abduction, no new knowledge would be possible, therefore, ultimately, no knowledge at all would ever be attained without the ability to formulate hypotheses. In abductive inferences the reasoner infers the *implicans* from the *implicatum*, but – given that for any *implicatum* there can be more *implicans* – the conclusion is only plausible. While the neat sentential formulation of abduction in syllogistic terms shows some aspects of it, namely its provisional and fallacious nature; by considering it from a deductive perspective, it cannot but return a conception of abduction that does not do justice to its local and situational nature.

More than an exhaustive formulation of abduction, the syllogistic framework served the role of introducing abduction in a clear and formal fashion and paved the way for further elaboration. In the well-known distinction proposed by Reichenbach (1972), while induction and deduction pertain to the context of justification, in which, given a selected hypothesis, predictions are deductively drawn and inductively tested through experimentation, abduction occurs in the context of discovery, in which amidst alternative competing hypotheses, one is selected as worthy of further investigation. To put it in other terms, abduction calls for a leap: “Though its security is low, its uberty is high” (CP 8.388), meaning that abduction is at the same time the most uncertain but the most rewarding form of inference.

Another formulation of abductive inference which does not rest on a sentential and deductive treatment and is functional to introduce psychological and contextual elements can be found in Peirce's work (CP 5.189):

- 1) The surprising fact C is observed,
- 2) but if A were true, C would be a matter of course.
- 3) Hence there is reason to suspect that A is true.

This formulation of abduction indicates that Peirce was aware that something different than pure logic – intended here as syntactic manipulation of symbols based on rules – is involved in abductive reasoning. Due to its contextual nature, the epistemic states of a subject cannot be left out in the quest to define it. *Surprise*, *suspect* and *matter-of-courseness* are central to understand the functioning of abduction. That is to say, when examining its functioning, it is necessary to consider the perspective of a subject performing the abduction as well as the contextual clues he or she is able to pick up in order to generate the hypothesis. In this sense, unlike deduction and induction, there is no context-free abduction. Similarly, while deduction and induction can be treated with quantitative and formal methods, abduction proved much more difficult to formalise. This is due to the fact that abductive reasoning resembles more closely a form of art perfected through practice than a technique performed algorithmically of which step-by-step instruction can be provided. Nonetheless, there are various attempts to proposing formal representations of abduction. such as the AKM schema and, more recently, the GW schema (Gabbay, Woods 2005, 336–342). To recapitulate, abduction is a defeasible, non-truth preserving, context-sensitive and ampliative form of reasoning. It is based on the conscious and unconscious detection of clues and it is dependent on the knowledge of the agent.

Woods (2012, 2013) and Magnani (2015, 2017, 2018) have devoted much work to shift the general perspective on fallacies, of which abduction is the most famous case, by interpreting them from an agent-centered, goal-directed, resource-bound logic of human reasoning. Following both authors, while they are commonly treated as errors of reasoning, from a naturalistic perspective according to which the agent has to deal with limited internal and external cognitive resources, fallacies may represent the best strategies to reach satisfactory cognitive performances. Moreover, in order to stress the moral import of the use of fallacies in everyday life and their relation to the coalition enforcement hypothesis, Magnani argues that abduction has to be understood as a form of distributed military intelligence (2011).

The central point of their characterisation of abduction is its strategic nature, which was already *in nuce* in previous characterisations of abduction (Paavola 2004). Hypotheses are formulated and operationalised, i.e. pragmatically accepted as true also on the basis of strategic and context-dependent considerations. According to Woods, abduction is a response to an ignorance problem. Given that we need to act upon uncertainty, we have three epistemological options: surrender, subduance or abduction. In the first case, we keep our ignorance and do not find a solution nor a positive basis for action, in the second case we find a solution in the environment by using proper means. The third case, abduction, is a mixture of the two: as in the first case we do not overcome ignorance, as in the second case we have a positive basis for action - with the difference that the knowledge that gives us the basis for action is defeasibly held: we go on with an as-if attitude, hoping that our guess – the abducted hypothesis – is correct.

Of course, the ultimate goal of the agent is to overcome ignorance, but in some cases this is not immediately possible, thus: “no one should think that the goal of abduction is to keep oneself in ignorance. The goal is to make the best of the ignorance that one chances to be in” (Woods 2013, 368). Conversely, as we will see, deception can be understood as making the best of the ignorance *another agent* chances to be in. It follows that, in relation to deception, I will only consider those cases in which the hypothesis is generated as a response to ignorance and it plays an explanatory role, leaving aside the analysis of non-explanatory hypotheses.

Recently, Stanley and Nyrup (2020) have pointed out the strategic nature of abductive reasoning, investigating it in medical diagnosis. Their work also indicates another crucial feature of hypothetical reasoning: the fact that the identification of clues that lead the generation of hypotheses is skill-dependent, which means that, in order to detect the relevant clues, it is necessary to have sufficient experience to know where to direct the attention, to which signs look out for, what counts as pattern and what is mere noise.

Deception, counterdeception and hypothetical reasoning

When discussing hypothetical reasoning, from Peirce to contemporary philosophers, one of the crucial questions has been that of answering the cut-down problem (Gabbay, Woods 2005, 56), i.e. how, given the infinite number of possible explanations for any surprising fact, we are able to draw only few and often quite accurate conjectures to account for a surprising fact. In contrast, little philosophical attention has been devoted to analyse those cases in which selected hypotheses are wrong, and less so to those cases in which said wrongness is the result of other agents’ intentional effort.

In order to understand how abductive reasoning is tied to deception it is necessary to shift the focus of attention from the agent that makes the abductive inference to another agent, which is external to the process and wants to direct it. Since abduction is highly contextual, by modifying the context, e.g. by disseminating appropriate clues, it is possible in principle to indirectly suggest a hypothesis. If deception and hypothetical inference are strictly connected, it should be possible to elaborate a normative account of deception and counterdeception by considering the features of hypothetical reasoning. In this section, I analyse the relation between some of the key features of abduction individuated above and deception, while at the same time confronting them with those individuated by the military deception theorist B. Whaley and psychologist of intelligence analysis R. Heuer.

Given the central role of deception in the contemporary warfare (Holt 2010, Liddell Hart 1967, Rein 2018, Whaley 2007), it is not a surprise that abductive reasoning in relation to deception has been investigated by military strategists and intelligence analysts. Moreover, these researches, being functional to form intelligence analysts and strategic planners, are rich of practical examples and are normative in nature. Military intelligence, far from being a strictly and abstract enterprise, seeks to explain how to make do of scant resources in order to quickly forecast, predict and decide which action to pursue. Military intelligence analysts recognise the inherent limitations of human cognitive capabilities. As such, their perspectives can fruitfully interact with the understanding of abductive reasoning exposed above.

At the beginning of *Practise to Deceive, Learning Curves of Military Deception Planners*, Barton Whaley – who is credited with the systematisation of the research on deception in military settings, the invention of the term counterdeception and whose work is considered

the “beachehead of deception studies” (Mitchell 2016, 6) – presents some requisites necessary for the success of deception, which are strikingly similar to those the philosophical literature individuated in relation to the process of abductive reasoning. Moreover, when describing the characteristics which belong to a good counterdeceptionist, he identifies abduction as the main form of reasoning in which she ought to excel (2006, x).

For example in order for the deception to be successful, according to Whaley, it is necessary to lead the enemy through the following steps:

- Take notice, if the effect is designed to attract his ATTENTION;
- find it relevant, if the effect can hold his INTEREST;
- form the intended hypothesis about its meaning, if the project pattern of characteristics is CONGRUENT with patterns already part of his experience and memory; and
- fail to detect the deception, if none of the ever-present characteristics that are INCONGRUENT are accessible to his sensors (2016, 15)

Whaley highlights the attentional element, which is necessary to detect the implanted deceptive clues, the role of interest, which establishes what clue is relevant, the fact that the intended hypothesis must be congruent, i.e. does not contradict the target’s knowledge and experience and that if no contradiction is found, the deception is not detected and the intended hypothesis is assumed.

If the cognitive elements Whaley identifies are necessary for the positive outcome of a deception, there are many more aspects that need to be considered, some of these are:

Mutual reinforcing clues and skill-dependency: I have noted above that hypothetical reasoning is based on clues. A wet road may indicate that it has been raining, a broken window may indicate that someone has broken in, sore throat may point to upcoming flu. Of course, a hypothesis is stronger if it is based on more than one clue pointing to the same hypothesis and more so if those clues are detected through different senses or information channels. Therefore in order to deceive it is suggested that several intentionally crafted and mutually reinforcing signs are left to be discovered by the agent we desire to deceive. Similarly, it is necessary to know background knowledge and skills possessed by the agent, to know what she will look for, where she will direct her attention and what she will expect. A clue that cannot be recognized or correctly interpreted will be useless or potentially harmful to the success of the deception. Moreover, considering the contextual nature of hypothetical reasoning, situational factors such as timing are to be considered.

Matching drawn implications: the act of forecasting the implications drawn from the deceitful hypothesis in order to ensure that subsequent empirical verification meets such expectations can be an extremely daunting task. The difficulty of this task is – of course – situationally dependent. Indeed, following Woods (2012, 24), it is necessary to distinguish between consequence-having and consequence-drawing, the latter occurs in the reasoner’s mind, while the former in the logical space. Since any given hypothesis presents an infinite number of implications (consequence-having), it is computationally impossible and pragmatically useless to derive them all. In fact, no human has ever considered all possible implications of any single hypothesis. When a hypothesis is assumed, only a restricted number of relevant implications are drawn (consequence-drawing) and eventually verified by means of empirical observations. The result is that out of the infinite number of implications that can be drawn from a hypothesis, the deceiver needs to forecast those that will be drawn by the deceived person, in order to match these expectations in further investigations. To do so, the deception

has to be crafted by considering what the deceived holds as plausible and relevant. This also means that any information which may contradict the deceiving hypothesis and its implications need to be hidden.

Exploitation of biases: while some fallacies depending on the context can be considered as smart heuristics that have a strategic value, biases such as confirmatory bias, selective bias and mirror imaging plague reasoning. Ultimately the link between abductive reasoning and deception resides in belief-formation. Thus, biases related to belief-formation can also be used to perfectionate a deception. These biases jointed with familiarity with the deceived person beliefs may help to make possible to preventively assess which hypotheses are more probable to be formulated by the target of the deception. For example, by knowing what the deceived person believes as the most probable future scenario, it will be easier to suggest to her the false hypothesis consisting exactly in what she expects. This means that to deceive is not simply to impose a false hypothesis, because the process may easily fail, but it also requires assessing what hypotheses the target of the deception may more easily infer.

The role of biases in deception has been investigated by the intelligence analysts R. Heuer. A philosophy student interested in epistemology, Heuer was employed by the CIA during the Korean War, 25 years later, in 1975, he moved to the Directorate of Intelligence. During his career, Heuer was interested in perfecting a methodology to apply to suspected cases of deception. To this end he invented a quasi-formal eight-step method called Analysis of Competing Hypotheses (ACH), used to choose between alternative hypotheses, while avoiding what he calls cognitive traps for intelligence analysis, i.e. biases. Fascinated by H. Simon's research on bounded rationality and keenly interested in the work of the heuristics and biases research tradition championed by Kahneman (2011) and Tversky, Heuer devoted much of his intellectual resources to find a methodology to handle biases and to teach it to intelligence analysts.

He considered deception in most cases as an unproven but not disproved hypothesis, which means that there may not evidence of being deceived, but considering the nature of deception this absence may paradoxically be a positive evidence for it. Thus, the absence of evidence for the hypothesis of being deceived shall never lead to the rejection of that hypothesis. "You may reject the possibility of denial and deception", writes Heuer (1999, 98), "because you see no evidence of it, but rejection is not justified under these circumstances. If deception is planned well and properly implemented, one should not expect to find evidence of it readily at hand". In non-cooperative interactions, in principle, the hypothesis of being deceived should never be discarded on the basis of it being unproved. It follows that, when being deceived, the best approach would be the one that Feyerabend calls second counterrule, "which favours hypotheses inconsistent with observations, facts and experimental results" (1993, 22), the tricky part being knowing when is opportune to adopt the counterrule and when it is not.

A case study from Burma campaign during WWII

Let me now introduce a historical case that may help to further clarify and provide substance to the relations between hypothetical reasoning and deception. The case study will furnish an example from a military context of a successful deception and it will help to display concretely some of the strategies used to direct others' hypothetical inferences, discussed above.

Made aware of the huge cost in terms of life and morale caused by the massacres resulted from the stolid direct approach insistently pursued in WWI, during WWII strategists and planners on both sides relentlessly engaged in manufacturing deception and stratagems. From the well-known operation Fortitude that confused the Nazis regarding the real intention of the Allies in the invasion of Europe, to many lesser known, comparatively minor cases.

The case¹ I am about to present belongs to the second category of minor cases. The operation, code-named Plan ERROR, took place in the India-Burma theatre in 1942, the protagonists were Colonel Peter Fleming and Archibald Wavell. The former, also known as the brother of James Bond's inventor, was at the time well-known in his own right as an explorer, a brilliant writer and journalist, who frequently wrote editorials for *The Times* of London. While Fleming was on his first venture in military deception, Wavell had a long and successful track record of intelligence operations on his shoulders. Indeed, he was involved in deceptive operations since the Second Anglo-Boer war (1899-1902) and created the world first deception team, known as the A force in Cairo in 1940 during the North African campaign. When he was moved to the Greek theatre, Rommel, another very seasoned figure in terms of military ruses, discussing British commanders, said "most have a certain tendency to think along established lines. The only one to show a touch of genius was Wavell" (Whaley 2016, 57).

The deception took place in the context of the Japanese conquest of Burma in 1942, a lesser known chapter of WWII. The campaign was motivated on the Japanese side by the desire to cut reinforcements and supplies to China that were in-transit through Burma as well as by their need to expand and reinforce their western flank in South-East Asia. After the conquest of Rangoon, Japanese troops quickly conquered as far as the border with India. The British high command feared a Japanese invasion of India for which they were greatly underprepared. After arriving in Delhi, in March 1942, Wavell appointed Fleming as Director of Deception. There, together with Military Secretary, B. Fergusson, Fleming and Wavell started planning operation ERROR. The objective of the plan was to make the Japanese believe that British forces were arriving en masse to reinforce the Indian front. The plan served to discourage Japanese intentions to invade India, an invasion for which the British were not prepared and that would have had catastrophic results for the Allies. To this end, the two prepared a number of fake documents designed for the Japanese to find in Wavell's car along the Burmese front. The documents included handwritten information implying that India was heavily guarded, that two more reinforcing armies were arriving on the front, that a new secret weapon was being prepared by the British, insinuating that the British lines were much stronger than in fact they were. Besides documents relevant to the deception, to make it more believable, Fleming convinced Wavell to also include personal items such as a photograph of his daughter and some private letters he had genuinely written or received. Afraid that the documents could have been found by the Chinese local troops before the Japanese arrived, they ordered to send out a radio warning informing that the area was filled with landmines. At this point everything was ready to stage the deception: Fleming and Wavell faked a car crash; skid-marks were left on the road ahead of the location where they left the car in plain sight; and the car was abandoned with broken windows, the engine still running and generally with "the appearances of having been abandoned in a hurry" (Whaley, 2016, 94). Afterwards, Wavell sent a communication to London saying that it "Might help if [an] impression of anxiety over seriousness of loss of papers in Burma were fostered".

¹ Information regarding the case here presented comes from Holt (2010 p.295–297) and Whaley (2016, p. 88–94).

Described above are all signs intentionally crafted in order to mislead the Japanese into believing that the documents they were about to find were faithful. Further, the two deception experts designed this ploy as way to exploit Japanese ignorance regarding the state of British defence in India. Finally, they tried to match the implications the Japanese commanders would draw from the deceiving hypothesis by projecting nervousness for the loss of important documents. In short, everything – from the skid-marks on the road to the appearances of nervousness over the seriousness of the documents lost – was set to hijack the Japanese commanders’ hypothetical reasoning and mislead them into taking the veracity of the ordeal at face value.

In this example, many of the elements that I described as necessary to the success of the deception are present: the hypothesis deceivers (here represented by Wavell and Fleming) wanted to inoculate in the target (the Japanese commandants) was the belief that India was heavily garrisoned by English troops and that an invasion was not feasible. The strangeness of the setting captured the Japanese attention and led them to inspect the car. The deceptive clues are here represented by the documents purposely abandoned, the staged car crash and the other signs that induced the Japanese into believing the sham.

While the British had no immediate proof that the Japanese took the bait, in 1944 Fleming received information that during the 1942 Burma invasion the Japanese found important documents informing them that India was heavily garrisoned. Ironically, the Japanese had no intention to invade India and even the conquest of Burma was an improvised decision that served to guard their far-west flank in South-East Asia. Nonetheless, the deception Wavell and Fleming devised displayed many of the characteristics that contribute to the success of a deception, intended as a form of manipulation of the adversary’s abductive reasoning, implemented through the intentional display of clues.

Conclusion

Before I conclude by indicating some plausible further research paths on the topic discussed, I wish to briefly point out the advantages of the framework here presented. By showing the epistemological and cognitive dynamics involved in deception, it is possible to put forward a normative account of deception and counterdeception. In doing so, I have turned to both the philosophical literature on abductive reasoning – in particular to those authors which stress its strategic nature – and to the literature of military deception focused on the relation of hypothetical reasoning and deception.

Nonetheless, this is but a first step in unveiling the relation between abductive reasoning and deception. For example, I have not analysed how deception can be performed through various kinds of clues or signs. Notoriously, Peirce identifies three kinds of signs depending on their relations to the objects they represent: index based on causal relations, icon based on resemblance and symbol based on conventions. How these are differently used in deception or how they affect the deceptive dynamics is left to future discussions.

Similarly, I have limited the application of the understanding of deception as the manipulation of abductive reasoning to military setting, but it could also be easily applied to animal interaction such as camouflage and in social setting, such as the interesting phenomenon of slacking at work while pretending to be busy performing a task, for which the French use the term ‘la perruque’ (De Certeau 1984, 24).

Finally, I have not specified how this approach to deception relates to the case of verbal deception, i.e. to lies. While detecting lies may be similar to detecting deception: following Elkman's psychological analysis of lies (1985), liars can be betrayed by involuntarily displaying signs, called nonverbal leakage, that show their untruthfulness, such as revealing facial expression, fidgeting or varying the tone of voice; it seems, at least at first, far-fetched to understand lying as directing other persons' hypothetical reasoning.

Acknowledgements

I wish to thank the participants to the conference Cognition and Lying 2019 for their precious comments and remarks.

Bibliography

- De Certeau, M. (1984): *The Practice of Everyday Life*, University of California Press.
- Elkman, P. (1985): *Telling Lies Clues to Deceit in the Marketplace, Politics, and Marriage*, Norton & Company.
- Feyerabend, P. (1993): *Against Method*, Verso.
- Gabbay D. M., Woods, J. (2005): *The Reach of Abduction, Insight and Trial*, Elsevier.
- Heuer, Jr. R. J. (1999): *Psychology of Intelligence Analysis*, Center for the study of intelligence.
- Holt, T. (2010): *The Deceivers: Allied Military Deception in the Second World War*, Skyhorse.
- Lloyd, M. (1999): *The Art of Military Deception*, Pen and Sword.
- Liddell Hart, B.H. (1967): *Strategy: The Indirect Approach*, Faber & Faber.
- Kahneman D. (2011): *Thinking, Fast and Slow*, Farrar, Straus and Giroux.
- Magnani, L. (2011): *Understanding Violence*, Springer.
- Magnani, L. (2015): Naturalizing logic, *Logic Journal of IGPL*, 13 (1), 13–36, available at: < <https://doi.org/10.1016/j.jal.2014.11.001> >.
- Magnani, L. (2017): *The Abductive Structure of Scientific Creativity*, Springer.
- Magnani, L. (2018): The Urgent Need of a Naturalized Logic. *Philosophies*, 3(4), 3–44, available at: < <https://doi.org/10.3390/philosophies3040044> >.
- Mahon, J. (2018): Contemporary Approaches to the Philosophy of Lying, in Meibauer J. (ed.) *The Oxford Handbook of Lying*, Oxford University Press, 32–55, available at: < <https://doi.org/10.1093/oxfordhb/9780198736578.013.3> >.

Marsili N. (2018): Lying and Uncertainty in Meibauer, J. (ed.) *The Oxford Handbook of Lying*, Oxford University Press, 32–55, available at: < [10.1093/oxfordhb/9780198736578.013.12](https://doi.org/10.1093/oxfordhb/9780198736578.013.12) >.

Mitchell, W. L. (2016): *The Art of Deception and the Role of Intelligence Education*, International Studies Association Annual Conference, available at: < https://pure.fak.dk/ws/files/5985901/MAIN_PAPER_ATLANTA_2016_FINAL_Draft.pdf >.

Paavola, S. (2004): Abduction as a logic and methodology of discovery: The importance of strategies, *Foundations of Science* 9, 267–283, available at: < <https://doi.org/10.1023/B:FODA.0000042843.48932.25> >.

Peirce, C.S. (1931-1958): *The Collected Papers of Charles Sanders Peirce*, Harvard University Press.

Reichenbach, H. (1977): *The Philosophical Significance of the Theory of Relativity*, in Schilpp, P. A. (ed.) *Albert Einstein: Philosopher Scientist*, Open Court Pub Co.

Rein, C. M. (ed.) (2018): *Weaving the Tangled Web, Military Deception in Large Scale Combat Operations*, Army University Press.

Stanley D. E. Nyrop R. (2020): Strategies in Abduction: Generating and Selecting Diagnostic Hypotheses, *Journal of Medicine and Philosophy*, 45 (2), 159–178, available at: < <https://doi.org/10.1093/jmp/jhz041> >.

Whaley, B. (2006): *Detecting Deception: A Bibliography of Counterdeception Across Time, Cultures, And Disciplines*, Foreign Denial & Deception Committee, available at: < <https://www.hsdl.org/?view&did=24046> >.

Whaley, B. (2007): *Stratagem, Deception and Surprise in War*, Artech House.

Whaley, B. (2016): *Practise to Deceive, Learning Curves of Military Deception Planners*, Naval Institute Press (Kindle edition).

Woods, J. (2012): Cognitive economics and the logic of abduction, *The Review of Symbolic Logic* 5(1), 148–161, available at: < <https://doi.org/10.1017/S175502031100027X> >

Woods, J. (2013): *Errors of Reasoning Naturalizing the Logic of Inference*, College Publications.



This work can be used in accordance with the Creative Commons BY-NC-ND 4.0 International license terms and conditions (<https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>). This does not apply to works or elements (such as images or photographs) that are used in the work under a contractual license or exception or limitation to relevant rights.
