

On the misuse of the notion of ‘abduction’ in linguistics¹

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‘Abduction’, a concept from the philosophy of Charles Peirce, has become extremely popular in linguistics in the last three decades. This article argues that the interpretation of abduction in (historical) linguistics is based on a critical misunderstanding: it relies on an aborted model, which was rejected by Peirce himself, and it conflates two incompatible frameworks (Peirce’s early and late ideas), to create a picture that is entirely incoherent. In consequence, it puts linguists directly at odds with mainstream practice in philosophy and science. Moreover, as currently interpreted, the term ‘abductive change’ is neither adequate nor necessary for classifying linguistic innovations.

The concept of ABDUCTION, which was borrowed from the American philosopher Charles S. Peirce, was introduced into linguistics almost thirty years ago by Henning Andersen (1973), and has become extremely popular and widespread in the last three decades, especially in historical linguistics. Andersen was not the first linguist to mention the term abduction. Chomsky (1968 [1972]: 90ff.), for example, discussed abduction in the context of his claims about innateness. But Andersen was the first to use abduction as the basis for a theory of language change, and it is on his discussion that historical linguists base their interpretation of this concept. However, this article will show that Andersen’s use of the term ‘abduction’ was based on a serious misunderstanding. Andersen relied on Peirce’s early attempts to define abduction, a model that was rejected by Peirce himself in his later writings, and which has no echo in modern philosophy or science. He then conflated this abortive early model with Peirce’s later and incompatible notions, to create an incoherent framework. In consequence, many linguists’ use of the terms ‘abduction’ and ‘induction’ is critically confused, and puts them directly at odds with mainstream practice in philosophy and in

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scientific disciplines. Finally, I shall argue that the term abduction, as used in historical linguistics, is neither adequate nor necessary for classifying linguistic innovations. What is couched in philosophical terms as ‘abductive change’ can simply be called ‘reanalysis’; what is called ‘deductive change’ is just ‘(analogical) extension’.

I. PEIRCE’S NOTION(S) OF ABDUCTION

In order to appreciate the misunderstandings besetting linguists’ use of the term ‘abduction’, it is necessary to give an outline of this term’s development in Peirce’s writing.² Unfortunately, Peirce’s groundbreaking notion of abduction suffers acutely from a problem which is typical of his work: as is generally recognised, consistency in terminology was never Peirce’s strongest point.³ During half a century of vastly prolific writing, Peirce was constantly rethinking and reformulating his ideas, and used a variety of different terms for the same notions, and sometimes very different notions for the same terms. On the one hand, what in some essays is called ‘abduction’ in others is variously called ‘hypothesis’, ‘retroduction’, ‘presupposition’ or ‘presumption’.⁴ On the other hand, his ideas about ‘abduction’ changed considerably during his lifetime.

Most commentators divide Peirce’s writings roughly into two main periods, with the transition around the turn of the twentieth century.⁵ In the nineteenth century, he used the terms deduction, induction and abduction as different modes of inference. In the twentieth century, however, Peirce came

[2] Only a brief summary can be given here. A detailed survey can be found in Fann 1970 and Anderson 1986.

[3] Bertrand Russell said about Peirce that he was

a man of tremendous energy, producing a multitude of ideas, good, bad, and indifferent. He reminds one of a volcano spouting vast masses of rock, of which some, on examination, turn out to be nuggets of pure gold (1969: xvi).

Other commentators are more explicit:

The variation to be found in his views on abduction is, of course, typical of Peirce’s writings. (Burks 1946: 301)

Readers of Peirce can hardly help but feel the importance of Peirce’s theory of abduction in his philosophy, but it is by no means clear what the nature of abduction is. His writings on this subject are typically fragmentary and, as a consequence, we find many different views represented. (Fann 1970: 5)

But Peirce gives no systematically coherent account of abduction; although he is invariably talking about hypotheses when he speaks of abduction, it is not at all plain just what he intends to say about them. (Frankfurt 1958: 593)

[4] In his early period, Peirce used the term HYPOTHESIS. Later he mainly called it ABDUCTION, but in his latest writing he seems to have used RETRODUCTION (e.g. 7.97). In between, he also used the terms PRESUPPOSITION and PRESUMPTION (Burks 1946: 301; Reilly 1970: 31).

[5] See Burks (1946: 301), Frankfurt (1958: 593), Fann (1970: 28), Reilly (1970: 34), Anderson (1986: 147).

to use abduction in a much more general sense, as the process of forming ANY explanatory hypothesis, whereas deduction and induction were demoted to merely phases of testing an already formed hypothesis.

1.1 *Peirce's early ideas*

Peirce adhered to the traditional distinction between DEDUCTIVE INFERENCE, which is logically valid, and AMPLIATIVE INFERENCE, in which the conclusion contains more information than the premises, and is therefore fallible. His philosophy broke new ground, however, in distinguishing further between two kinds of ampliative inference: INDUCTION and ABDUCTION. Since both these inferences are logically invalid (and therefore fallible), why is a division between them necessary? In essence, Peirce was trying to distinguish between a mere GENERALISATION (induction) and an inference which requires some CONCEPTUAL LEAP (abduction). Induction, as generally understood in his time, was the generalisation of a property from a sample to the whole class. Abduction (the term introduced by Peirce)⁶ is the conceptual leap from data to an explaining hypothesis. Peirce showed that a mere generalisation of a property is inadequate to describe many of the inferences made in science and even in everyday life. To give a trivial example, it is one thing to see a few apples fall to the ground, and from there infer by generalisation that all apples will always do so. (This is induction.) It is quite another thing to see apples fall to the ground, and from there infer that all bodies are attracted to the earth in a force that is proportional to their mass. (This would require abduction.) Both inferences are ampliative, and fallible. But whereas induction only involves a generalisation of an obvious property of some apples (falling to the ground) to the whole class, abduction involves some conceptual leap. Here, the leap is to an entirely different level of abstraction, and to concepts that cannot even be directly observed (mass, force). In Peirce's words:

The great difference between induction and hypothesis [abduction] is, that the former infers the existence of phenomena such as we have observed in cases which are similar, while hypothesis [abduction] supposes something of a different kind from what we have directly observed, and frequently something which it would be impossible for us to observe directly. (2.640)

Although the intuition about the difference between the two ampliative modes of inference was clearly there from the beginning, Peirce struggled for a long time to crystallise his ideas and describe the distinction in a coherent way. Before the 1890s, Peirce felt bound to express his very general notions within the straitjacket of Aristotelian logic. He therefore tried to describe

[6] A term which he claimed corresponds to Aristotle's ἀπαγωγή (7.249), cf. also (1.65), where he calls it 'retroduction'.

the difference between induction and abduction by representing them as different permutations of the Aristotelian deductive syllogism. These attempts were aborted later, when he realised that they were at best tangential to the real distinction that he was trying to make.

Since these early attempts were rejected by Peirce himself, and since they have no echo at all in modern philosophy or science, there would be no reason to dwell on them here, were it not for one unfortunate fact: this aborted early model is the basis on which the current interpretation of abduction in linguistics is founded. To untangle the misunderstanding in linguistics, therefore, we must briefly follow Peirce's early ideas, and see why they were later abandoned. It should be remembered, however, that Peirce's early examples are actually unhelpful, as he himself later recognised. His real purpose in distinguishing between abduction and induction needs to be explained IN SPITE OF these early examples, not BY them.

Peirce's understanding of 'deduction' is entirely traditional. To demonstrate deduction, he used the following example (2.619–631): we have a bag which contains only white beans, and from it we take out a few beans. Since we know the bag contains only white beans, we can deduce that the beans in our hand must be white. Deduction is a logically valid inference. Ever since Aristotle, deductive inferences have been represented as a syllogism, in which if the two premises are true, the conclusion MUST also be true:

(1) *Deduction*

Premises: All beans from this bag are white.
 These beans are from this bag.
 Conclusion: These beans are white.

Peirce then went on to describe his two ampliative modes of inference with the same example of beans and bag. In induction, we generalise a property from a sample to the whole class. We take some beans out of a bag, and they are all white. We therefore hypothesise by generalisation that ALL the beans in that bag are white. This inference is ampliative, and it is fallible (some beans deep down in the bag may actually be black). Peirce of course recognised that induction was not a logically valid inference. Nevertheless, he believed that in order to make such an inference 'respectable', he had to coerce it into the straightjacket of the syllogistic formula. He did this by swapping the conclusion and one of the premises in the formula in (1) above:⁷

[7] Peirce used the labels RULE, CASE and RESULT to describe the three elements of the syllogism which he shuffled around. These labels are quite misleading and seem to have been at least partly responsible for Andersen's confusion. I therefore omitted them, and added in square brackets more informative labels for induction and abduction. The fact that very different labels will be needed for abduction may also help to clarify why the permutation of premises and conclusions in the syllogism is only a misleading graphic device.

(2) *Induction*

Premises: [a sample]
These beans are from this bag.

[property of the sample]
These beans are white.

Conclusion: [generalisation of the property to the whole class]
All beans from this bag are white.

Finally, Peirce used the same statements to demonstrate abduction (which he here calls 'hypothesis'). He says:

Suppose I enter a room and there find a number of bags, containing different kinds of beans. On a table there is a handful of white beans; and, after some searching, I find one of the bags contains white beans only.
(2.623)

From there, he infers that the beans on the table must have come from the bag containing only white beans. Like induction, abduction is also fallible: the white beans may actually have come from a different source (for example, someone could have collected only white beans from other bags, and put them on the table). But unlike induction, the inference here involves more than just a generalisation of a property from a sample to the whole class. The abductive inference requires some 'leap', the formation of a hypothesis to explain how there came to be only white beans on the table. Here, this leap consists of matching a fact with a general rule which would explain it. We start by observing that all the beans on the table are white. This fact needs explanation, because most of the bags in the room contain a mixture of beans in different colours. So we look around to see what general rule could explain our observed fact. We find such a rule when we see that one particular bag in the room contains only white beans. We thus MATCH that rule with our observed fact, and hypothesise that this rule is the right explanation for our fact. Again, believing he had to represent all types of inference in the confines of the Aristotelian syllogism, Peirce demonstrated 'abduction' with another permutation of the syllogism in (1) above:

(3) *Abduction*

Premises: [general rule]
All beans from this bag are white.

[observed fact in need of explanation]
These beans are white.

Conclusion: [matching the fact with a rule that can explain it]
These beans are from this bag.

1.2 *Peirce's later writings*

Later on in his life, Peirce realised that the model above is both deceptive and unhelpful. First, the permutations of premises and conclusions are in fact tangential to the real distinction he was trying to draw, that between a mere generalisation of an obvious property and a conceptual leap. Moreover, Peirce understood that the early model was much too narrow to describe the range of actual inferences made in science and in everyday life.⁸ His early model of abduction was limited to merely the matching of some ALREADY KNOWN rule with an observed fact in need of explanation. For convenience, I shall use the label PEA ('Peirce's Early Abduction') for this early model. There are, of course, many inferences which PEA does adequately describe. The inference made with the beans is one example. Another example would be finding a ripe apple on the ground below an apple tree, and matching this observed fact with the already known rule that ripe apples fall to the ground, to make the inference that that apple must have got there by falling from that tree. However, as Peirce recognised in his later work, PEA is much too narrow to describe other types of hypothetic leaps. For example, the mere matching of a known rule to an observed fact cannot describe the inference from falling apples to the law of gravitation which I mentioned above. When Newton saw apples falling to the ground, there was no already known rule which could be matched with the observed fact to provide the notion of gravitation. The essence of his creative leap was precisely to INVENT that new rule.⁹

Because of these inadequacies, Peirce rejected his early attempts to describe induction and abduction as permutations of the Aristotelian syllogism. In 1910, he wrote: 'in almost everything I printed before the beginning of this century, I more or less mixed up ... abduction and induction' (8.227). In his later period, he came to use abduction in a much more general way, as the process by which any creative hypothesis is formed. Peirce now described the abductive inference in the formula below:

(4) *Peirce's later notion of abduction* (5.189)

The surprising fact, 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.

Abduction thus came to be understood as the process of inferring ANY hypothesis which, if true, would explain the observed facts. This more general formulation could describe all kinds of different inferences: from the

[8] As Douglas Anderson (1986: 148) observes, 'it is probable that Peirce's recognition of this very narrowness led him toward his later conception'.

[9] Of course, I am not trying to imply that apples were the actual source of Newton's inference.

work of a genius (inferring gravitation from falling apples), to trivial everyday inferences: seeing an apple on the ground, and inferring that it fell from the tree.

Whereas Peirce generalised the concept of abduction in his later writing, his ‘induction’ was demoted from a mode of inference to a mere phase of testing a hypothesis. In his later writings, he came to talk about abduction, deduction and induction as three stages of scientific inquiry: abduction forms hypotheses, deduction and especially induction are merely methods of testing them. Needless to say, the overview above gives only a highly schematic picture of the development of Peirce’s notion of abduction.¹⁰ Still, the basic division between early and late Peirce will suffice to demonstrate how abduction was misinterpreted by Andersen. Before we can proceed to linguistics, however, we need to sort out the relation between Peirce’s terminology and that of contemporary science and philosophy.

1.3 *Peirce’s terminology and contemporary philosophy*

Peirce’s pioneering ideas, and the distinction that he struggled to make between different types of ampliative inference, have been highly influential in later philosophy of science. However, most of his actual explanations were superseded in the twentieth century, and his terminology is not in general use outside the restricted circle of Peirce scholarship.¹¹ In contemporary philosophy and in the sciences, INDUCTION is a wide term. INDUCTIVE INFERENCE is often used for ALL TYPES OF AMPLIATIVE INFERENCES: not only for a generalisation from a sample to a whole class (Peirce’s early induction), but also for any inference from facts to a theory which might explain them (Peirce’s later abduction).¹² Peirce’s later (idiosyncratic) use of ‘induction’,

[10] In reality, his ideas went through further meanderings and reached other dead-ends before he developed his later notions. For example, in the 1880s Peirce also tried to describe abduction in a probabilistic model, but he later rejected these attempts himself (cf. 2.706, 2.102, and Fann 1970: 25–26).

[11] Harris & Hoover (1983: 132), for example, lament that ‘most current discussions of the problem of induction proceed without reference to Peirce’s critical distinction’, and that his terms are ‘too much ignored outside the constricted space of Peirce scholarship’.

[12] The *Routledge encyclopedia of philosophy* explains INDUCTIVE INFERENCE as follows:

According to a long tradition, an inductive inference is an inference from a premise of the form ‘all observed A are B’ to a conclusion of the form ‘all A are B’. Such inferences are not deductively valid, that is, even if the premise is true it is possible that the conclusion is false, since unobserved A’s may differ from observed ones. ... It is now generally allowed that there are many other patterns of inference that can also provide reasonable grounds for believing their conclusions, even though their premises do not guarantee the truth of their conclusions. In current usage, it is common to call all such inferences inductive. (Craig 1998)

The *Oxford dictionary of philosophy* explains under INDUCTION:

The term is most widely used for any process of reasoning that takes us from empirical premises to empirical conclusions, supported by the premises, but not

Early Peirce	Late Peirce	Modern Philosophy of Science
Deduction	Deduction	Deduction
Induction	–	Enumerative induction
–	Abduction	Inference to the best explanation
		} Inductive inference

Table 1
Peirce's terms and modern philosophy

as a mere phase in testing a hypothesis, is thus directly at odds with the way this term is used by philosophers and scientists.

When a distinction between different kinds of ampliative inference is made in modern philosophy, the more narrow inference from a sample to the whole (Peirce's early induction) is known as *ENUMERATIVE INDUCTION*.¹³ Peirce's later notion of 'abduction' (the more creative 'leap' to an explanatory hypothesis) has been refined, and is today generally known as *INFERENCE TO THE BEST EXPLANATION*.¹⁴ Table I summarises the relationship between

deductively entailed by them. Inductive arguments are therefore kinds of ampliative arguments, in which something beyond the content of the premises is inferred. (Blackburn 1996)

[13] Thus, the *Oxford dictionary of philosophy* continues:

Induction is, however, commonly distinguished from arguments to theoretical explanation ... by being confined to inference in which the conclusion involves the same properties or relations as the premises. The central example is induction by simple enumeration ... If this, that, and the other person deceive them, children may well infer that everyone is a deceiver. (Blackburn 1996)

[14] The difference between Peirce's abduction and the modern understanding of 'inference to the best explanation' is a complex issue, but an example may give an idea of what is involved. Suppose we see a ripe apple on the ground beneath an apple tree. According to Peirce, we make the inference that the apple fell from the tree, because, if true, this inference would explain the observed fact (i.e. it would explain why the apple is there). But there are many other hypotheses which would also explain this fact if they were true. For example, the apple could have dropped from a child's bag, or the apple could have been placed there by a landscape sculptor. However, the inference we actually make, and the one which is most likely to be true, is the one which according to our experience would be the *BEST* explanation for the evidence. As Mautner (1996, s.v. abduction) explains:

Since then, it has been stressed that what makes [the 'abductive' inference] probable is that it is the *BEST* explanation we can think of. Scientifically useful abduction is, then, inference to the best explanation.

Peirce of course recognized that there are different hypotheses which, if true, could explain the available evidence. He also suggested criteria for choosing between different hypotheses once they have been formed (e.g. simplicity, economy, and ease of falsification). However, his pioneering discussion is no longer seen as adequate today. One of the important issues that Peirce did not address is the relationship between the likelihood of a hypothesis to be true, and the 'amount of understanding' a hypothesis would provide if it were true (cf. Lipton 1991: 61ff.). Although we generally believe that the most likely explanation should also give the greatest amount of understanding, this relation cannot be taken for granted.

Peirce’s terms and those of modern philosophy. The empty cells show where there is no echo to Peirce’s terms in modern philosophy: his early model of abduction (PEA), which he himself rejected, and his later notion of induction (a mere phase of testing hypothesis), which is directly at odds with the use of the term ‘inductive inference’ by scientists and philosophers.

2. THE MISUSES OF ‘ ABDUCTION ’ IN LINGUISTICS

2.1 *Initial misunderstandings*

We are now in a better position to see how the notion of abduction was misrepresented in linguistics. In his 1973 article, Andersen used abduction as a basis for a theory of language change. But his discussion suffers from fundamental problems. First, he based his argument on Peirce’s early attempts to distinguish between abduction and induction, a model that Peirce himself later rejected as inadequate. Then, Andersen misunderstood even Peirce’s early ideas. Finally, having defined induction and abduction according to Peirce’s early model, Andersen went on to use these terms in Peirce’s later sense, and thus created an incoherent framework.

Andersen’s exposition starts with a misunderstanding of the term ‘induction’, denying its ampliative nature, and according it the status of infallibility:

It is usual to distinguish two modes of inference, induction and deduction. Both modes operate with the three propositions that constitute a syllogism: the rule or LAW (e.g. ‘All men are mortal’), the CASE (e.g. ‘Socrates is a man’), and the RESULT (e.g. ‘Socrates is mortal’). While inductive inference proceeds from observed cases and results to establish a law, deduction applies a law to a case and predicts a result. These two modes of inference share two important characteristics: first, the conclusion asserts nothing which is not given in the two premises; second – and this is a natural corollary – if the premises are true, the conclusion is certain to be true. (Andersen 1973: 774–775)

To see why it is incorrect that in induction, ‘if the premises are true the conclusion is certain to be true’, just replace the word ‘mortal’ with the word ‘Athenian’. According to Andersen, from the two premises ‘Socrates is a man’ and ‘Socrates is Athenian’ we would establish a valid conclusion: ‘all men are Athenian’. This error cannot be blamed on Peirce, of course, who explicitly differentiated deduction from the ampliative and fallible inferences: induction and abduction. In fact, over the past three centuries, one of the

‘Conspiracy theories’ are good examples of where the two criteria can diverge. A conspiracy theory which claims that many unrelated phenomena (from AIDS to UFOs, etc.) are the result of CIA machinations would provide a great amount of understanding if it were true, but is still unlikely to be true.

most important problems in the philosophy of science has been the ‘problem of induction’: precisely the fact that inductive reasoning is NOT logically valid.

Andersen then goes on to explain ‘abduction’. We have seen that Peirce tried initially to formalise the distinction between induction and abduction as different permutations of the deductive syllogism. These attempts were later abandoned, because they are tangential to the real distinction Peirce was trying to make, namely the difference between a mere generalisation and a conceptual ‘leap’. But Andersen’s explanation of ‘abduction’ is based on the aborted concept (PEA). He explains abduction as the matching of an observed fact with an already known law that would explain it:

There is a third mode of inference, termed abduction by Charles S. Peirce, which is often confused with induction. Abduction proceeds from an observed result, invokes a law, and infers that something may be the case. E.g., given the fact that Socrates is dead, we may relate this fact to the general law that all men are mortal and guess that Socrates was a man. This inference differs essentially from the conclusions reached by inductive and deductive reasoning. Although it, too, is based strictly on its premises, it is not necessarily true, even though its premises are: if we have matched the given result with the wrong law, our conclusion may be false. (Andersen 1973: 775)

Although this definition is based on a model which was rejected by Peirce himself, and which has no echo in modern philosophy, Andersen’s misinterpretation has been accepted uncritically in historical linguistics. The result is that there is little relation between linguists’ abduction and the way this term is understood by philosophers. The divergence can most easily be seen if we compare the definitions of abduction in some recent dictionaries of linguistics and of philosophy. Matthews’ *Oxford concise dictionary of linguistics* defines abduction as:

Process of reasoning by which e.g. from ‘All dogs bark’ and ‘This animal barks’, one draws the conclusion that ‘This animal is a dog’. (Matthews 1997)

Trask’s *Dictionary of historical and comparative linguistics* defines it as:

A type of reasoning in which we observe a result, invoke a general law which could derive that result from a given starting point, and conclude that that starting point must be true. Example:

‘Communists want to ban handguns; Susie wants to ban handguns; therefore Susie must be a Communist.’ (Trask 2000)

Compare these definitions with what dictionaries of philosophy have to say. According to the *Cambridge dictionary of philosophy*, abduction is:

Canons of reasoning for the discovery ... of scientific hypotheses or theories. (Audi 1999)

The *Oxford companion to philosophy* explains:

Abductive reasoning accepts a conclusion on the grounds that it explains the available evidence. The term was introduced by Charles Peirce to describe an inference pattern sometimes called 'hypothesis' or 'inference to the best explanation'. (Honderich 1995)

Had we not known about the development of Peirce's ideas, it would have been difficult to see any relation between the dictionaries of linguistics (simplistic version of early Peirce) and the dictionaries of philosophy (later Peirce).

Of course, one could argue that there is no copyright on the use of jargon. Even if Andersen misunderstood Peirce, even if Peirce himself rejected the interpretation of abduction that is now common in linguistics, and even if linguists use 'abduction' in a sense that is at odds with the rest of the world, one could argue that linguists still have the right to use any term in any way they choose. This would undoubtedly be a valid argument if two conditions were met: first, if linguists used the term COHERENTLY; second, if their interpretation of this term was USEFUL. But I shall now argue that neither of these conditions is in fact met.

2.2 *Ensuing incoherence*

The incoherence in the treatment of abduction in linguistics starts with Andersen's own article. Andersen's initial definitions used Peirce's aborted early model, but misrepresented even that model. In the following paragraphs, the picture is confused further, by jumping from Peirce's early model to his later ideas. As we have seen, Peirce generalised the notion of abduction in his later writings, and viewed it as the process by which ANY hypothesis is made. On the other hand, he demoted induction and deduction to merely stages of checking the validity of an already formed hypothesis. These later ideas, as recognised by Peirce himself, are incompatible with his earlier model of abduction and induction. But Andersen conflates these two incompatible models: having defined abduction, induction, and deduction in Peirce's early model, Andersen goes on to use these terms in Peirce's later sense, apparently without realising that the concepts that he is now using are entirely different from the ones he has defined in the previous paragraphs:

The process of probing the validity of a hypothesis is the business of deduction and induction. Deduction tests the hypothesis by predicting what results the law entails in particular cases. Induction tests it by matching it to new observed cases and results. (Andersen 1973: 775)

Andersen then goes on to build a whole theory of language change based on a conflation of two incompatible frameworks, by using the same terms to mean different things in different places. In one paragraph, he talks about ‘abduction’ according to his original definition, as the matching of observed results with a given law. In the next paragraphs, he builds a model of language-learning based on alternations of ‘abductions’ (to form hypotheses) and ‘inductions’ (to test them).¹⁵ But such use of abduction and induction would only make sense in Peirce’s later, and incompatible, model.

Following Andersen’s article, the term ‘abduction’ has become extremely popular in linguistics. But the numerous discussions of abduction are often plagued with similar inconsistency and confusion. For example, Anttila, who in numerous publications did much to promote the concept of ‘abduction’, adopted Andersen’s descriptions uncritically, and repeated precisely the same errors: defining the terms in one sense and using them in another. In his textbook, for example, Anttila (1989: 196) repeats Andersen’s explanation of the difference between induction, abduction and deduction as the permutations of the syllogism. But only a few lines later, he talks about them as three stages of inquiry. Moreover, later on in the same book (1989: 404), Anttila uses Peirce’s late generalised explanation of ‘abduction’, without realising that this formulation is not equivalent to the definitions he used before.

Discussions by other historical linguists are usually based on Andersen or Anttila, and suffer from similar incoherence. Consider one more example, which demonstrates just how critical the confusions have become. Let us return to Trask’s definition of ‘abduction’ which was quoted above. Most of the entry is quoted here, but we shall concentrate on the example given to demonstrate the ABDUCTIVE MODE OF INNOVATION:

abduction A type of reasoning in which we observe a result, invoke a general law which could derive that result from a given starting point, and conclude that that starting point must be true. Example:

[15] On page 776, for example, Andersen uses ‘abduction’ according to Peirce’s early model, as the matching of an observed fact with one of the (known) rules of universal grammar:

In acquiring his language, a learner observes the verbal activity of his elders, construes it as ... the output of a grammar ... and guesses at what that grammar might be. He has ... [a] reliable set of ‘laws’, which he shares with all members of his species, viz. the properties of his constitution that completely determine the nature of linguistic structure.

But in the following paragraph, Andersen jumps to the later model:

As he builds up his grammar ... the learner constantly tests its validity by use of both induction and deduction. He checks new utterances produced by his models against the relevant parts of his grammar, to see whether these new data ... can be reconciled with the linguistic structure he has formulated ... in conformity with the ‘laws’ of language; this is induction.

But this is NOT the induction of the early model, which was used in the previous paragraph. It is induction in Peirce’s later model.

‘Communists want to ban handguns; Susie wants to ban handguns; therefore Susie must be a Communist.’ Such reasoning is invalid but it appears to be important in human affairs. The linguist Henning Andersen has particularly stressed the importance of abductive reasoning in accounting for certain types of linguistic change, such as reanalysis. Andersen distinguishes between an *abductive mode of innovation*, in which elements of grammar are inferred from speech, and a *deductive mode of innovation*, in which elements of speech are derived from a grammar ...

AN EXAMPLE OF THE FIRST: ‘I HAVE HEARD PEOPLE SAYING THINGS LIKE BOOKS AND TREES; THEREFORE THERE MUST BE A RULE OF ENGLISH THAT NOUNS ARE PLURALIZED BY ADDING -S.’ [Emphasis added – GD.] An example of the second: ‘I have a rule that nouns are pluralized by adding -s; I have just encountered the new noun *CD-ROM*; therefore its plural must be *CD-ROMS*.’ When one of these processes leads to a change in the language, we speak of *abductive change* or of *deductive change*, respectively. (Trask 2000)

Let us examine Trask’s example of ‘abductive innovation’. A language learner observes that some nouns like *book* and *tree* have a certain property, namely a plural in *-s*. From this sample, he infers the generalisation that ALL nouns have a plural in *-s*. But is this inference ‘abduction’ in the sense that Trask has just defined and exemplified with Communists and handguns? Certainly not. The inference here is not abduction, but rather INDUCTION, in the narrowest and purest sense of ‘enumerative induction’: the generalisation from a sample to the whole class. This is actually an excellent example of exactly the narrow type of inference that Peirce wanted to distinguish FROM abduction. (Recall Peirce’s example of induction with the beans: we see some beans in a bag and they are all white, so we generalise that ALL beans in the bag are white. The inference here is parallel: we hear a few nouns which have a plural in *-s*, so we infer that ALL nouns have a plural in *-s*.)

Such examples from the linguistic literature could be multiplied, but a survey of different types of incoherence may only increase the confusion. The fact that a recent dictionary can use a pure instance of ‘enumerative induction’ to demonstrate ‘abduction’ (a concept whose whole *raison d’être* was to be set apart from the narrow generalisation involved in ‘enumerative induction’) is by itself sufficient to show just how serious the confusions in linguistics have become.

3. IS PEA USEFUL OR NECESSARY?

It may be argued that confusions, even critical ones, can be put right. If the interpretation of abduction in linguistics (PEA) at least served some useful purpose, it would be worthwhile to salvage it from the confusions to which it has sunk. But this section will argue that there is no need to waste any efforts on such a salvage operation. While Peirce’s later ideas can offer many

insights into the nature of linguistic inference, his aborted early model of abduction (PEA) is both INADEQUATE and UNNECESSARY for classifying linguistic innovations, and should be discarded.

What, then, is Peirce's early model of abduction useful for? In Andersen's theory, it serves as a basis for a typology of linguistic inferences, and in particular, a two-way distinction between 'abductive' and 'deductive' innovations. There is no doubt that PEA can indeed account for SOME linguistic innovations. As we have seen, PEA involves the matching of an observed fact with an already known rule that would explain it. In language, the observed fact is a surface utterance, and the rule that can explain it is a linguistic structure. A linguistic innovation can result from PEA when a surface utterance is matched with the 'wrong' rule, that is, with a different structure from what was intended by the speaker. A prototypical example of such an innovation is the emergence of the singular noun *pea* from the earlier *peas(e)*. Originally, the noun *pease* was a singular form, with a plural *peasen* or *peses*. But during the sixteenth century, the plural form was reduced to *peas*, and then a new singular form arose: *pea*. This innovation is a prototypical instance of PEA:

(5) Premises: [a known rule:]
Noun + *s* > plural

[observed fact:]
Peas is a noun, ending in *-s*.

Conclusion: [matching the fact with a known rule that can explain it:]
Peas must have come from *pea* + *s*.
(Hence its singular form is *pea*.)

However, while PEA can account for inferences of this type, we do not actually have any need for the term 'abduction' to describe such innovations, because we have a much simpler and better term for them. Consider again Trask's definition of abduction: 'The linguist Henning Andersen has particularly stressed the importance of abductive reasoning in accounting for certain types of linguistic change, SUCH AS reanalysis' (my emphasis). I would like to pose a simple question: which OTHER types of linguistic change, except reanalysis, does Andersen's abduction (i.e. PEA) account for? The answer is as simple as the question: there are NO OTHER SUCH TYPES OF LINGUISTIC CHANGE. 'Abductive change' is just a fancy way of saying 'reanalysis'. Reanalysis is a change in the underlying structure of an utterance which does not involve modifications on the surface. In other words, it is the attribution of a 'wrong' structure to a surface utterance. By definition, therefore, any application of PEA which leads to innovation is an instance of reanalysis.

Reanalysis is a simple term, with no excess baggage of incoherence and critical confusions. But this is not the only reason why we should prefer it to

PEA. Reanalysis is also a more adequate concept, because it is not constrained by the arbitrary narrowness of Peirce’s early model. Reanalysis does not require that the new structure assigned to a surface form be a result of an ALREADY EXISTING rule. Peirce rejected PEA precisely because there are creative inferences in science and everyday life which do not involve the matching of a fact with an already known rule. Similarly, there are creative linguistic innovations which can be described by ‘reanalysis’, but which PEA is too narrow to explain. Consider, for instance, the inference made by the child who, upon being presented with a fork with three prongs, called it a ‘threek’. His inference required the invention of the following rule: ‘An N-pronged instrument is called N-k’. We can represent this inference in Peirce’s later model of abduction (following the schema in (4) above):

(6) The surprising fact is observed: an instrument is called ‘fork’.

But if it were true that there was a rule: ‘An N-pronged instrument is called N-k’, the form ‘fork’ would be a matter of course.

Conclusion:

Hence, I have reason to suspect that there is such a rule (so a three-pronged instrument is a ‘threek’).

Alas, the hypothesis turns out to be wrong. But crucially, this inference cannot be described by the narrow PEA model. There was no ALREADY KNOWN rule here, which was matched with the observed fact. The creative essence of the inference was precisely the invention of a new rule: hypothesising an original non-arbitrary relation between a certain object and its linguistic form. This is an instance of reanalysis because it assigns a new structure to a surface form (which originally had no structure at all). But the creative leap involved in this reanalysis cannot be described as the matching of a ‘wrong’ existing rule with an observed fact since there was no such rule before the child had invented it. Not only, then, is every innovation based on PEA by definition an instance of reanalysis, but we also see that reanalysis is a better concept for describing the whole range of ‘abductive changes’ that PEA purports to cover.

The other half of Andersen’s typology, ‘deductive change’, is also a complex philosophical term for a more down-to-earth linguistic concept: ‘extension’. In ‘deductive innovation’, elements of speech are derived from the grammar. An existing grammatical rule is used to produce a surface form which was not there before, or in other words, an existing rule is used in a context where it was not used before. Extension (or ‘analogical extension’) is just the same: it is the process in which an existing linguistic rule is extended from a more restricted context to a less restricted one. By definition, therefore, any ‘deductive innovation’ is necessarily an instance of ‘ex-

tension'. Needless to say, all the examples of 'deductive change' given by Andersen and others are simple instances of extension.

The typology of changes that is couched in the philosophical terms 'abductive' and 'deductive' thus boils down to the simple LINGUISTIC distinction between 'reanalysis' and 'extension'. This distinction, in fact, forms the backbone of a recent typology of syntactic changes (Harris & Campbell 1995), and can also apply to morphology (Deutscher 2001). The terms 'reanalysis' and 'extension' are simple and intuitive. They are not weighed down by a baggage of incoherence and critical misunderstandings, and they do not put linguists' terminology at odds with the rest of the world. Moreover, they do not suffer from the arbitrary limitations imposed by Peirce's early model, and are thus more adequate to describe and classify linguistic innovations. Finally, and more generally, 'reanalysis' and 'extension' do not attempt to classify something simple and well understood in terms of something complex and poorly understood. They classify linguistic innovations on the linguistic level itself, not by descending to that great uncharted territory of the human capacity for reasoning.

4. CONCLUSION

I have argued that (historical) linguists' interpretation of 'abduction' is beset by critical confusion. This interpretation was extracted from Peirce's early writings, and is based on a model abandoned by Peirce himself. The conflation of this aborted model with Peirce's later ideas has created an incoherent picture, and has put linguists' terminology at odds with philosophers and scientists. Moreover, the term 'abductive innovation' is neither adequate nor necessary for a typology of linguistic innovations. The distinction between 'abductive' and 'deductive' innovations can more simply and adequately be made on the linguistic level itself, with the concepts 'reanalysis' and 'extension'.

This is not to say that Peirce's insights are unimportant for linguistics. For one thing, Peirce's unified treatment of scientific and everyday inferences (logically invalid and fallible as they may be) helps us to ground the inferences made by language learners in the framework of the general human capacity for reasoning. Moreover, the questions that Peirce raised about the nature of inference still stand at the core of any theory that attempts to explain language learning and change. How are hypotheses for new linguistic rules formed in the mind? How does a language learner decide between alternative rules that can explain the same surface form? What, from the point of view of the language learner, represents the 'best explanation' for his/her input?

But when approaching these questions, the useful insights are to be found in Peirce's mature ideas, in his later generalised notion of 'abduction', and in the refinements made to his ideas by later philosophers. Peirce's early

model, which he abandoned himself (and for good reason), should be laid to rest in his *Collected papers*, from where it should never have been dragged in the first place.

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