Herlinde STUDER

CONDITIONS OF KNOWLEDGE

I

In this paper I suggest an account of knowledge by adding a fourth condition to the traditional analysis in terms of justified true belief. I am going to make a first proposal ruling out the Gettier-counterexamples.[1] This proposal will then be corrected in the light of other counterexamples. The final analysis will be a combination of a justified-true-belief-account and a causal account of knowledge.

Some philosophers have disputed that Gettier's examples must be accepted as refutations of the justified true belief analysis of knowledge.[2] Their rejection rests on declining a principle underlying Gettier's reasoning, namely – as Thalberg calls it – the principle of deducibility of justification (PDJ). PDJ reads as following:

> For any proposition p, if a person S is justified in believing p, and p entails q, and S deduces q from p and accepts q as a result of this deduction, then S is justified in believing q.

This principle allows, for example, the move in Gettier's first example from the proposition a) "Jones is the man who will get the job and Jones has ten coins in his pocket" to proposition b) "The man who will get the job has ten coins in his pocket".

---

[1] See Edmund L. Gettier, „Is Justified True Belief Knowledge?" *Analysis* 23, 1963, pp. 121-123.
[2] See Irving Thalberg, „In Defense of Justified True Belief", *Journal of Philosophy* 66, 1969, pp. 794-803. Thalberg's arguments have been criticised by David Coder, "Thalberg's Defense of Justified True Belief", *Journal of Philosophy* 67, 1970, pp. 424-425; Michael K. Hooker, "In Defense of the Principle of Deducibility of Justification", *Philosophical Studies* 24, 1973, pp. 402-406; John T. Saunders, "Thalberg's Challenge to Justification via Deduction", *Philosophical Studies* 23, 1972, pp. 358-364.
A new formulation of his criticism Thalberg puts forward in: Irving Thalberg, "Is Justification Transmissible through Deduction?" *Philosophical Studies* 25, pp. 347-356; see also Rovert J. Richman, "Justified True Belief as Knowledge", *Canadian Journal of Philosophy* 4, 1975, pp. 435-439; G.W.Fitch, "Richman on the Principle of Deducibility for Justification", *Canadian Journal of Philosophy* 6, 1976, pp. 299-302.

I think that this discussion which tries to refute Gettier's examples by disputing this principle PDJ is focusing on a wrong point. Gettier's examples are odd and one has a feeling that something has gone wrong, but the peculiarity of the cases doesn't rest on PDJ. Disputing its validity or to confine its validity to true propositions is not the best way to exclude the Gettier-counterexamples.

The point which is substantial for Gettier's examples is the fact that the derived proposition is made true by completely different facts than those for which one has evidence.[3] I can believe a derived proposition on the basis of the evidence I have for the premises. But if it turns out that the derived proposition is true where the premises are false, then the relation between evidence-condition and truth-condition must have changed.

In Gettier's cited example, Smith has evidence for a certain proposition a, and he accepts a derived proposition b on the basis of this evidence. But proposition b is made true by completely different facts than those for which Smith has evidence. – This is also obvious in Gettier's second example. There Smith derives from the proposition "Jones owns a Ford" for which he has strong evidence the following three propositions:

"Either Jones owns a Ford, or Brown is in Boston"
"Either Jones owns a Ford, or Brown is in Barcelona"
"Either Jones owns a Ford, or Brown is in Brest-Litowsk"

Now it turns out that Jones does not own a Ford, but Brown – just by coincidence – happens to be in Barcelona.
The sentence is made true by a completely different fact than the one for which Smith has evidence, i.e. the second part of the disjunction is true, but the first part, for which Smith has evidence, is false.

There is no connection between the evidence Smith has and the truth of the proposition and this is why Gettier's examples are defective. When we concede someone to have knowledge on the basis of certain evidence we assume that his evidence is in some way connected with the truth or being the case of the things for which he claims to have knowledge. Would there be no such connection we would speak of a lucky guess and not of knowledge.

---

[3] Thalberg also mentions this point, but he is not developing it clearly as a criticism, but mixes it up with the use of the principle PDJ. See Thalberg, op. cit., pp. 798-801.

Demanding such a connection between the belief condition, the evidence-condition and the truth-condition of the traditional analysis of knowledge requires that we add a further condition, so that the analysis of knowledge[4] is the following:

S knows that p if and only if   (1) p is true

(2) S believes p

(3) S has good evidence for p

(4) p is made true by the facts for which S has evidence.

This condition rules out the Gettier-counterexamples.

As mentioned, there were also other examples raised against the traditional analysis of knowledge.[5] Let us consider one example suggested by Chisholm.[6] A man sees a sheep in a field; it is evident to him that there is a sheep. But the man has mistaken a dog for a sheep. Suppose now that there is a sheep in another part of the field about which the man has no evidence. Although the conditions for knowledge are fulfilled, we would not say that the man knows that there is a sheep in the field.

Does our added condition rule out this example? Are the facts which make the proposition that there is a sheep in the field true different from the facts for which the man has evidence? It seems to me that this is actually the case. The man has evidence that there is a sheep in a certain part of the field, but the proposition is made true by the fact that there happens to be a sheep in another part of the field.

Nevertheless our condition will not do. A look at a specific group of counterexamples (the causal ones) will show that. Take the following example proposed by Alvin. I. Goldman.[7] A person S observes that there is solidified lava in various parts of the countryside. On the basis of this evidence together with various background beliefs about the origin of lava S believes that a nearby mountain erupted several centuries ago. Suppose the following situation: After

---

[4] Our analysis of knowledge is restricted to empirical knowledge, i.e. nonbasic knowledge in the sense that this knowledge is dependent on evidence we have gained through experience.

[5] In these examples no derivations occur. Hence philosophers discussing only the validity of the principle PDJ fail to recognize the full dimension of the problem.

[6] See Roderick Chisholm, *Theory of Knowledge*, Second edition, Englewood Cliffs N.J.: Prentice Hall, 1977, p. 105.

[7] Alvin I. Goldman, „A Causal Theory of Knowing", *Journal of Philosophy* 64, 1967, p. 361.

the eruption of the mountain a man somehow had removed all the lava. A century later a different man put lava in the countryside as he wanted the place to look as if there had been a volcano-eruption. So the lava which S observes and which brings him to believe that a volcano erupted was not connected with the actual eruption. Considered the situation we would not say that S knows that the volcano erupted. On the other hand our conditions for knowledge are fulfilled. Also the added fourth condition is met. The proposition that a volcano erupted is made true by the facts for which S has evidence, since S has evidence for the fact that a volcano erupted.

Equally, the added fourth condition does not rule out an example given by Meinong.[8] In an Austrian garden the birds are kept away by the whistling of an Aeolian harp. Now suppose that someone who lived in the surroundings of that harp for a long time tends to have hallucinatory auditory experiences. Imagine now that this person hallucinates to hear the sounds of the Aeolian harp at exactly the moment the harp actually sounds. In that case the fourth condition is also fulfilled: the man has evidence for the fact that the harp is sounding. Obviously the fourth condition is too weak. The proposed connection between the epistemic condition and the truth condition must be strengthened to rule out such examples. But before we are going to modify our fourth condition, I want to take a look at two other attempts to amend the traditional analysis in order to rule out (not only Gettier-type) counterexamples.

II

By a reformulation of his third condition R. Chisholm tries to rule out the mentioned counterexamples.[9] He corrects the third condition to "h is nondefectively evident for S". And "nondefectively evident" is defined in the following way: "h is nondefectively evident for S = Df Either h is certain for S, or h is evident for S and is entailed by a conjunction of propositions each having for S a basis which is not a basis of any false proposition for S".[10] This repaired definition of knowledge Chisholm applies e.g. to Gettier's second counterexample. The derived proposition "Jones owns a Ford or Brown is in Barcelona" is defectively evident, since the only set of self presenting propositions that makes this proposition evident also makes evident the false proposition "Jones owns a Ford". Similarly

[8] See A. Meinong, *Über die Erfahrungsgrundlagen unseres Wissens*, Berlin: Julius Springer, 1906, pp. 398-399. The example is also cited by Chisholm. See R. Chisholm, op. cit., p. 104.
[9] Chisholm's conditions for knowledge read: S knows that h is true = Df h is true, S accepts h and h is evident for S. See R. Chisholm, op. cit., p. 102.
[10] See R. Chisholm, op. cit., p. 109.

in the case of the sheep example: The proposition "There is a sheep in the field" is defectively evident as it is made evident for the man by the proposition "I take there to be a sheep in the field" and this proposition also makes evident the false one "What I take to be a sheep is a sheep."

Meinong's example is excluded in the following way: The proposition "I take that to be the sound of an Aeolian harp" gives S a basis for the true proposition that the Aeolian harp is sounding. But this proposition gives him equally a basis for the false proposition "The sounds which I now hear are caused by the whistling of the Aeolian harp". Hence, Chisholm concludes, the proposition that the Aeolian harp is sounding is defectively evident and so S does not know the proposition to be true.[11]

Keith Lehrer also tries to repair the traditional analysis of knowledge by adding a fourth condition, i.e. "S is completely justified in believing that p in some way that does not depend on any false statement".[12] Lehrer is explicating this condition (connected with his explication of the justification condition): "S is completely justified in believing that p in a way that does not depend on any false statement if and only if S is completely justified in believing that p in the verific alternative to the corrected doxastic system of S".[13] This needs explaining. The doxastic system of a man consists of statements saying that the man believes what he does, i.e. a set of statements articulating what he believes. The corrected doxastic system of S is that part of the doxastic system which results when every statement expressing that S believes something he would not believe any more as an impartial and disinterested truth-seeker is removed from the system.[14] Now the verific alternative to the corrected doxastic system (D) of a person S is a set of statements V developed out of the corrected doxastic system. In V all statements of D are contained if and only if it is true that p. Those statements claiming that p is false are substituted in V by the statement that S believes the denial of p. In other words: each belief of a true statement is maintained while each belief of a false statement is exchanged with the belief of the denial of that statement.

How does this (explicated) condition apply to the counterexamples? Lehrer thinks this to work in the following way: As mentioned, every belief of a false statement is turned into a

---

[11] See R. Chisholm, op. cit., pp. 109-111.
[12] See Keith Lehrer, *Knowledge*, Oxford: Clarendon Press, 1974, pp. 21-23.
[13] See Keith Lehrer, op. cit., p. 224.
[14] See Keith Lehrer, op. cit., p. 190.

belief of the denial of that statement. In Gettier's second counterexample Smith's belief that Jones owns a Ford is turned into the belief that Jones does not own a Ford. So, since the statement that S believes that Jones doesn't own a Ford is contained in Smith's verific alternative of his corrected doxastic system, Smith's true belief that Jones owns a Ford or Brown is in Barcelona (contained in the verific alternative since it is true) would be undermined by his belief that Jones does not own a Ford. Thus one could not say that Smith is completely justified in believing the derived proposition and hence Smith will lack knowledge.[15]

It seems to me that both Chisholm's and Lehrer's corrections of the traditional analysis have resulted in too strong conditions. Both their reformulations exclude cases which we should admit as instances of knowledge.

Take the following situation:[16] A person S is walking down the street. She observes a car by the roadside which is severely damaged. Suppose that the car is so damaged, that it is obvious that it can't be driven any more. On the basis of what she sees S believes that the car does not work any more and this is evident to her. Now imagine the following to have happened. Actually the car was stopped by the roadside by its owner because of a defect in its engine. The defect was so severe that the car didn't work any more. While the car was standing at the roadside, another car bumped into it and caused the heavy damage which our person later on observed.

Now in this case Chisholm's condition (3) is not fulfilled. The proposition "The car does not work any more" is defectively evident, for the basis which makes this proposition evident for S ("The car is severely damaged") makes also evident the false proposition "The car is not working any more just because it has been severely damaged". Although we would say that S is mistaken in regard to the cause of the car's stop, we would think that S knows that the car doesn't work.

Now let us look at Lehrer's condition. The belief of S "The car does not work any more because it has been damaged" is false. So the corrected doxastic system of person S would

[15] Lehrer is explicating this by means of the sheep example and one example invented by him. See Lehrer, op. cit., pp. 224, 225.
[16] A similar example was given by Brian Skyrms. See Brian Skyrms, "The Explication of 'X knows that p'", *Journal of Philosophy* 64, 1967, pp. 385-386.

contain the statement that S believes the denial of that statement, i.e. "The car does not work any more but not because it has been damaged." But this belief defeats S's justification for believing that the car doesn't work any more. One necessary condition for knowledge is not fulfilled, though we would say that S knows that the car is not working any more.

III

Let us go back to our proposed analysis. We have seen that my proposed account is insufficient. To see in which way my added condition must be modified let us consider once more Meinong's example. Here S hallucinates to hear the sounds of the harp at exactly the moment when the harp is actually sounding. Examples of this type can be excluded by demanding that there must be a causal connection between p and S's belief of p.
So we add the condition

(4'): S's belief in p is caused by p.

The man's auditory experiences which give rise to his belief that the harp is sounding are not caused by the sounding of the harp.[17]

Condition (4'), however, faces the difficulty that not every case of knowing p is of the sort that p causes the belief in p. In a restricted sense we can have knowledge of future events. For example, if a person is in certain physical conditions and believes that he will be ill the next day we would not say that his being ill the next day is the cause of his belief. This problem can be solved by introducing the notion of a common cause. Applied to our example this means that a certain physical state of the person causes his illness on the next day as well as his belief in that fact.[18]

So we have to reformulate our condition to

---

[17] Equally the Volcano-example is ruled cut by this condition. The belief of the man that the volcano erupted has not been caused by the actual eruption of the volcano.

[18] See Alvin I. Goldman, op. cit., pp. 364-365. See also D.M. Armstrong, *Belief, Truth and Knowledge*, Cambridge University Press, 173, p. 158.

(4'') S's belief in p is either caused by p or caused by a common cause
of p and of the belief state.

Yet our analysis will not do. The conditions I have formulated now are too strong. They exclude examples like the one I have used in arguing against the conditions proposed respectively by Chisholm and Lehrer. These examples are of the type where S is wrong about the cause of p, but where we nevertheless would concede that S knows p. The situation is such, that the event q, on the basis of which S believes p, is causally sufficient for the occurrence of p. In the car-example the damage is so severe that it is sufficient for the car not to work any more even if the car did not have a defect in its engine. In Skyrm's example we can assume that the man whose head is severed from his body is dead even if he had not endured a heart attack. We propose a condition (4''').

(4''') S's belief in p is either a) caused by p or b) caused by a common
cause of p and the belief-state or c) caused by an event or state q
which is causally sufficient for the occurrence of p.

Obviously c) makes b) redundant and so we get:

(4''') S's belief in p is either a) caused by p or b) caused by an event or
state q which is causally sufficient for the occurrence of p.

Nevertheless this condition faces a difficulty. It is met by cases which we should not regard as cases of knowledge. These situations are such that the causal chain leading to an event is interrupted, but the event nevertheless occurs as the causal chain is closed by another unexpected event. Such an example is given by M. Swain.[19] A person X has set about blasting a hole in a mountainside. X has planted TNT in the appropriate place and has wired the TNT to a detonator box which has a timer on it. Having carefully checked the wiring, the batteries and the TNT X is setting the timer. The explosion occurs as expected, but only because of luck. The wire was in fact severed and the battery in the detonator was just strong enough so that the current arced between the severed ends of the wire. In this case one would not say that X knew that the explosion will occur. But our condition (4''') is fulfilled. The state q (the setting of the timer, the wiring TNT to a detonator box etc.) which caused X to believe that

---

[19] See Marshall Swain, „Knowledge, Causality and Justification", *Journal of Philosophy* 69, 1972, p. 298.

the explosion will occur is (under normal conditions) causally sufficient for the explosion. We must add a restriction like "under relevant conditions fulfilled" to our condition, i.e. the event q is causally sufficient for the occurrence of p under normal circumstances.[20]

So the condition reads:

> (4''''') S's belief in p is either a) caused by p or b) caused by an event or
> state q that is causally sufficient under relevant conditions for
> the occurrence of p.[21]

In addition, I want to make some remarks about condition (3). A causal account of knowing could be formulated by omitting condition (3), consisting only of (1), (2) and (4''''') But this is not intended here. Condition (3) is preserved in this analysis since we want to combine a reliability account with a causal one. A causal analysis alone is not sufficient. This can be shown by the following example of D.M. Armstrong:[22]

A certain person P is in a deranged and hypersensitive state, so that almost any considerable sensory stimulus causes him to believe that there is a sound of a certain sort in his environment. Now it can be supposed that in a particular situation the sensory stimulus which causes P's belief is indeed a sound of that certain sort in his environment. Our condition (4''''') is fulfilled, but obviously P does not have knowledge of this sound. I think in this case our condition (3) rules out that in such a case knowledge is given. Since person P is in a deranged and hypersensitive state so that it is obviously hard for him to identify a sensory stimulus properly, we cannot say that this person has good evidence for p.[23]

The proposed account of knowledge now is:

(A1): S know that p if and only if

>   (i)   p is true
>   (ii)   S believes that p
>   (iii)   S has good evidence that p

---

[20] Of course it is a problem to formulate exactly the relevant conditions. However, coming up with an exact formulation is not a task of this paper.

[21] A similar, but more complex analysis of knowledge has been given by Marshall Swain. See Marshall Swain, "Knowledge, Causality, and Justification", pp. 291-300. Objections against Swain's account are made by Thomas D. Paxson Jr. See Thomas D. Paxson, "Prof. Swain's Account of Knowledge", *Philosophical Studies* 25, 1974, pp. 57-61.

[22] See D. M. Armstrong, op, cit., p. 158.

[23] In a full analysis of knowledge this condition of course must be explicated.

(iv)   S's belief in p is either a) induced by p or b) induced by an event or state q which is causally sufficient under relevant conditions for the occurrence of p.[24]

IV

Yet the analysis as it stands is not satisfactory. Further amendments have to be made. In the light of a counterexample discussed by Marshall Swain[25], it seems necessary to interpret part (b) of condition (iv) in a specific way. The structure of Swain's example is the following: A person's belief that e is caused by his belief that c and this belief is caused by the testimony of a reliable friend. Later on, the person gets information by another reliable friend which causes the person's belief d, which is a pseudo-overdeterminant of e. That means, that the belief d would have been a cause of the person's belief that e if his belief had not been caused already by his belief hat c. Now it is supposed that belief c is in fact false, the friend's testimony has been wrong; but the information of the other friend is correct. We would say that the person knows e on the basis of the subsequent information which is true, but this evidence has not caused the person's belief that e since the person already believes e. In this example part (b) of our condition (iv) is not fulfilled although we would regard it as a case of knowledge. To avoid that this example defeats our account we interpret condition (iv) b) in the following way:

(I*)   An event or state q is causally sufficient under relevant conditions for the occurrence of p if and only if that event is either a genuine over-determinant of p or a pseudo-overdeterminant of p.[26]

That condition (iv) b) is meant to include the case of genuine overdetermination is clear from the case of the car-damage in the light of which we introduced the notion of causal

---

[24] I use the term "induce" instead of "cause". This has been suggested to me by Alfred Schramm, whom I want to thank for many helpful discussions.

[25] See Marshall Swain, „Justification and the Basis of Belief", in: George S. Pappas (ed.), *Justification and Knowledge*, Dordrecht: D. Reidel, 1979, pp. 36, 37. I want to thank Keith Lehrer for drawing my attention to this point.

[26] I take these terms from Marshall Swain who defines these concepts precisely. See Marshall Swain, "Justification and the Basis of Belief", pp. 35, 36.

sufficiency. We want to understand 'causal sufficiency' also to include the relation of pseudo-overdetermination in order to account for examples as the one mentioned.[27]

A next amendment of our conditions cannot be avoided. We have to build in a specification in order to account for cases as the following.[28] In a museum a person is looking at a glass box that contains a vase. The person doesn't know that the surface of the glass box is in fact a very good constructed television screen so that the visual appearances of the person are exactly what they would be in the case the surface were glass and the vase in the box was directly perceived. Let us suppose that the appearance of the vase on the screen is the image of the vase in the box, which is actually in there.

In this case we cannot claim that the person knows that there is a vase in the box, although the person's belief is actually caused by the vase. In this example the causal chain is unusual, something occurs in the causal chain which undermines the evidence the person has. So we could say that the causal chain leading to the person's belief is defective since it contains a fact which provides undermining counterevidence and which actually defeats the person's knowledge-claim.

The concept of undermining counterevidence needs some clarification. When we say that there is undermining counterevidence we mean that there exist matters of fact which would provide counterevidence in an epistemic situation, if the person were aware of these facts. In order to elucidate the concept further let us consider the following case. In a museum a person (Milton) sees that someone (Tom Grabit) steals an artefact. Milton knows Tom Grabit; he also knows that Tom Grabit is a compulsive thief. Now it is assumed that Tom Grabit's mother is also in the museum and notices that her son takes the artefact. This causes her to utter a lie to someone close to her that Tom Grabit is in Australia. Milton does not hear this lie. Obviously he still knows that Tom Grabit stole the artefact, although there is some undermining counterevidence (the mother's utterance).

So it seems that undermining counterevidence can be given both in cases of knowing X and not-knowing X. Hence not every instance of undermining counterevidence defeats

---

[27] That pseudo-overdetermination can be considered as a form of causal relation has been argued by Marshall Swain, and I want to accept his thesis. See Marshall Swain, "Justification and the Basis of Belief", pp. 30-37.
[28] The example is again taken from Marshall Swain. See Marshall Swain, "Reasons, Causes, and Knowledge", *Journal of Philosophy* 85, 1978, p. 234.

knowledge. But if we look closer at the two cases of undermining counterevidence in the examples just outlined, we notice a difference. In the first example the undermining counterevidence (the appearance of the vase on the television-screen) is true[29]; whereas in the second example the counterevidence is false (the mother is telling a lie). If we take this difference into account we can distinguish the cases of defeating counterevidence from the cases of undermining counterevidence. This suggests the following correction of our condition (iv): we add to condition (iv) that in part a) as well as in part b) the belief must be non-defectively induced and interpret this as meaning that there exist no matters of fact which provide defeating counterevidence in the causal chain leading to the person's belief.

However, this modified condition is still too weak as we can see by means of the following example.[30] A medical researcher is seeking the causes of a certain nervous disorder and he has examined a large number of persons. He has identified the existence of the chemical C in the brain of these persons as the cause of this disorder. The sample he has chosen is biased compared with the total population having that specific disorder. Usually the disorder is caused by an undetectable genetic effect (that no one knows) and not by the chemical C. Now the following situation is assumed: a new patient having this disorder is visiting the researcher, the researcher concludes that the patient has element C in his brain. As luck will have it, the researcher is correct, the patient is one of the small group in which the disorder is caused by element C. But it seems that we cannot claim that the researcher knows that the person has element C in his brain. The problem with this case is that it fulfils also our tentatively proposed correction of condition (iv). In the causal chain leading to the person's belief there exist no matters of fact providing defeating counterevidence.

To account for examples of this complicated form I propose the following amendment of condition (iv):

> (iv) S's belief that p is either a) non-defectively induced by p or b) non-defectively induced by an event or state q which is causally sufficient under relevant conditions for the occurrence of p.

The non-defective inducement of a belief is to be understood in the following way:

---

[29] Precisely formulated this would mean that the statements expressing the evidence are true.

[30] This example is developed by Marshall Swain. See Marshall Swain, "Reasons, Causes, and Knowledge", p. 235.

(I**) A person's belief is non-defectively induced if and only if either a) there exist no matters of fact in the causal chain leading to the person's belief which provide defeating counterevidence or b) there exist no matters of fact which would provide defeating counterevidence if they occurred in the causal chain leading to the person's belief.[31]

Let us apply condition (iv) in this interpretation to some of the counterexamples we have considered. The case of the person in the museum looking at a vase in a glass box where the vase is actually appearing on a television screen is excluded as an instance of knowledge. The person's belief is defectively induced because the causal chain leading to the person's belief contains facts which provide defeating counterevidence. The medical-researcher-example is equally ruled out as a case of knowledge. There is a fact (i.e. the circumstance that the nervous disorder is usually caused by a genetic defect) which, if it occurred in the causal chain leading to the person's belief, would provide defeating counterevidence (which consequently would defeat the person's belief).

I think we also need not worry any more about the following example by Keith Lehrer.[32] The example is a modification of one of the Gettier-examples. Smith believes that Jones owns a Ford on the basis of seeing a contract (in fact it is not legal) saying that Jones owns a Ford.

---

[31] A similar account of knowledge has been given by Marshall Swain. See Marshall Swain, "Reasons, Causes, and Knowledge", pp. 232-237. But Swain interprets the defectiveness of a causal chain in a different way, namely: "Where S justifiably believes that h on the basis of R, causal chain X - Y is defective with respect to this justified belief if and only if, either (I) (a) there is some event or state of affairs U in X – Y such that S would be justified in believing that U did not occur, and (b) it is essential to S´s justifiably believing that h on the basis of R that S would be justified in believing that U did not occur; or (II) there is some significant alternative C* to X – Y with respect to S justifiably believing that h on the basis of R." 'Significant alternative' is interpreted in the following way: "C* is a significant alternative to X – Y with respect to S justifiably believing that h on the basis of R if (a) it is objectively likely that C* had occurred instead of X – Y, then there would have been an event or state of affairs U in C* such that S would not be justified in believing that h if S were justified in believing that U occurred". (See Marshall Swain, "Reasons, Causes and Knowledge", pp. 238-241.) Swain introduces the notion of significant alternative in order to rule out examples like the mentioned medical researcher example, since this example is not excluded by part (I) of Swain's defectiveness-condition.
However, Swain's interpretation of the concept of a significant alternative faces a serious problem. Consider the following version of the medical researcher example. Let us assume that in almost all cases the nervous disorder is caused by chemical C, only in a few cases by a genetic defect. Then there is no significant alternative to the causal chain with respect to the researcher's belief that element C is the cause of the nervous disorder, since the occurrence of the alternative causal chain (the genetic defect causing the nervous disorder) is not objectively likely. I think we would not say that the researcher knows the cause(s) of the nervous disorder, but Swain's conditions for knowledge are fulfilled. Swain himself discusses this problem by means of an example proposed by Alvin Goldman. (See M. Swain, "Reasons, Causes and Knowledge", pp. 240, 241). It seems to me that Swain doesn't provide a solution to this problem. The just outlined version of the medical researcher example is, however, excluded by my conditions, i.e. by part (b) of interpretation (I**). The few cases where the nervous disorder is caused by the genetic defect are indeed matters of fact which would provide defeating counterevidence if they occurred in the causal chain leading to the researcher's belief about the cause of the disease.
[32] Keith Lehrer put forward this example as an objection to an earlier version of this paper.

The existence of this contract causes Smith's belief that Jones owns a Ford and subsequently Smith's derived belief that either Jones owns a Ford or Brown is in Barcelona. Now, it is supposed that Brown (about whose activities Smith knows nothing) has also seen the contract and has departed for Barcelona, as he had consented to go to Barcelona if Jones owned a Ford. So the existence of the contract is causally sufficient for Smith's belief (since it caused the belief) and it is causally sufficient for Brown being in Barcelona. It turns out that Jones doesn't own a Ford but actually Brown is in Barcelona. Hence Smith doesn't know. But condition (iv) in the interpretation (I**) rules out this example since there are matters of fact in the causal chain leading to Smith's belief that either Jones owns a Ford of Brown is in Barcelona which are defectively induced. However, the case of Tom Grabit who steals an artefact fulfils our conditions of knowledge - which is a correct result. There exists no doubt a fact providing counterevidence if it occurred in the causal chain leading to the belief (the mother's utterance), but it provides only undermining, no defeating counterevidence. So our final proposal of an analysis of knowledge together with the interpretations (I*) and (I**) reads in the following way:

(A2): S knows that p if and only if

     (i)   p is true

     (ii)   S believes that p

     (iii)   S has good evidence that p

     (iv)   S's belief that p is either a) non-defectively induced by p or b) non-defectively induced by an event or state q which is causally sufficient under relevant conditions for the occurrence of p.