The causal theories of knowledge have been propounded in order to avoid the Gettier-type counter-examples to the 'justified true belief' analysis of knowledge. The Gettier-type counter-examples present some cases in which the evidence, completely justifying some person S in believing that P, is not causally connected with the state of affairs that P. The causal theorists try to unpack the justification clause by requiring that S's belief that P be caused, in some sense, by the state of affairs described by P. This causal relation, they suggest, is what makes S's belief a case of knowledge.

A causal view of knowledge was first found in Ramsey's brief note on 'knowledge' (this paper was published long before Gettier's article). His view combines elements of Causal and Reliability view. He writes,

"I have always said that a belief was knowledge if it was (i) true, (ii) certain, (iii) obtained by a reliable process......a belief, obtained by a reliable process must be caused by what are not beliefs in a way or with accompaniments that can be more or less relied on to give true beliefs, and if in this train of causation occur other intermediary beliefs,
these must all be true ones$^1$. In recent times, Alvin Goldman, Marshall Swain, Peter Unger and D. M. Armstrong with others represent different formulations of this theory. This chapter will contain a critical analysis of their theories.

Section : I  

Goldman's Causal Theory

Goldman's theory$^2$ is concerned with knowledge of empirical propositions only, since he thinks that the traditional analysis is adequate for knowledge of non-empirical truths. He examines Gettier's second example and holds that in this case there is no causal connection between the fact that Brown is in Barcelona and Smith's believing P. He thinks that if we can show a causal connection between the fact that makes P true and S's belief that P, we can block the Gettier-type counterexamples to the traditional analysis of knowledge.

To see whether this requirement is satisfied in all cases of empirical knowledge, he examines a variety of such causal connections. He says that knowledge can be acquired by a combination of perception and memory. In these two types of knowledge, causal connection is obvious. But all knowledge cannot be acquired from perception and memory. Knowledge is often based on inference. Goldman uses the term inference in a broader sense. He shows that in case of inference and
testimony, a causal chain from premise to conclusion is required to have correct knowledge. An additional requirement for knowledge based on inference is that a knower's inference be warranted. That is, the propositions on which one bases his belief of P must genuinely confirm P very highly, whether deductively or inductively. A causal chain which is reconstructed merely by lucky guess does not give us knowledge.

Goldman shows the deficiency of Clark's analysis as well as the traditional analysis by contrasting both of them with his own theory.

To the three conditions of knowledge given in the traditional view, Clark adds a further requirement that each of the belief's in S's chain of inference must be true. Goldman mentions some objections against Clark's analysis. John Turk Saunders and Narayan Champawat have raised the following counter-example to Clark's analysis.

"Suppose that Smith believes
(P) Jones owns a Ford
because his friend Brown whom he knows to be generally reliable and honest yesterday told Smith that Jones had always owned a Ford. Brown's information was correct, but today Jones sells
his Ford and replaces it with a Volkswagen. An hour later Jones is pleased to find that he is the proud owner of two cars: he has been lucky enough to win a Ford in a raffle. Smith's belief in P is not only justified and true, but is fully grounded, e.g., we suppose that each link in the chain of Smith's grounds is true\(^4\).

Here clearly Smith does not know P; yet he seems to satisfy Clark's analysis of knowing. Goldman claims that Smith's lack of knowledge can be accounted for in terms of his own analysis of knowledge according to which Smith does not know P because his believing P is not causally related to P, Jones' owning a Ford now. It is purely a coincidence that Jones owns a Ford today as well as yesterday. Goldman thinks that Clark's thesis can be saved from the above counter-example if it can be supplemented with his own analysis. He says that presumably it is one of Smith's beliefs that Jones' owning a Ford yesterday would result in Jones' owning a Ford now. This was undoubtedly one of his grounds for believing that Jones owns a Ford now. Since this belief is false, however, Clark's analysis would yield the correct consequence that Smith does not know P. But as Clark himself fails to take note of this point, Saunders and Champawat's putative counter-examples appear reasonable.
The following counter-example to Clark's thesis given by Lehrer is better than the former one, for Clark's analysis cannot avoid this counter-example.

"Suppose Smith bases his belief of

(p) Someone in his office owns a Ford on his belief of four propositions:

(q) Jones owns a Ford.

(r) Jones works in his office.

(s) Brown owns a Ford.

(t) Brown works in his office."

In fact, Smith knows, q, r, and t, but he does not know S because S is false. Since S is false, not all of Smith's ground for P are true, and, therefore, on Clark's analysis, Smith does not know P. Thus, Clark's analysis is too strong.

Goldman tries to improve upon Clark's requirements without making them too weak. Goldman's theory does not require, as Clark does, that all of S's grounds be true. What
is required is that enough of them be true to ensure the existence of at least one causal connection between P and S's belief of P. In Lehrer's example, Smith thinks that there are two ways in which he knows P: via his knowledge of the conjunction of s and t. But there is a causal connection, via q and r, between P and Smith's belief of P. And Goldman thinks that this connection is enough.

Lehrer's example enforces Goldman to notice the necessity of a further clarification of the notion of a "Causal Chain". He said earlier that causal chains with admixtures of inferences are causal chains. Now he adds that causal chains with admixtures of logical connections are causal chains. Unless his interpretation is allowed, Goldman thinks it is hard to see how facts like "Someone in the office owns a Ford" or "All men are mortal" could be causally connected with beliefs thereof.

Goldman advances the following causal principle.

"If x is logically related to Y and if Y is a cause of Z, then X is a cause of Z. Thus, suppose that q causes S's belief of q and that r causes S's belief of r. Next suppose that S infers q & r from his belief of q and of r. Then the
facts of q and r are causes of S's believing q & r.\textsuperscript{6}

With the help of this causal principle, Goldman formulates the analysis of knowing as follows:

"S knows that P if and only if the fact P is causally connected in an "appropriate" way with S's believing P."

"Appropriate" knowledge-producing causal processes include the following:

(1) Perception

(2) memory

(3) a causal chain, exemplifying that pattern which is correctly reconstructed by inferences, each of which is warranted (background propositions help to warrant an inference only if they are true).

(4) Combinations of (1), (2), and (3).

The question is, what sorts of causal connections the fact that h and S's believing that h are "appropriate" for knowledge? Goldman develops a list of several types of
causal connections but he does not claim that the list is exhaustive. The two main types are what he calls "Pattern 1" and "Pattern 2" causal chains. A causal chain of pattern 1 is a situation in which the fact that h is a causal ancestor of S's believing that h (for instance, ancestor of S's belief that a red ball is before him). A causal chain of pattern 2 is a situation in which the fact that h and S's belief that h are both effects of some common cause. He also singles out perception and memory as appropriate knowledge-producing causal processes. These are, however, special instances of one of the two basic patterns. He gives many instances which cover these kinds of causal situations. He says that it is at least a necessary condition of knowing that one's belief be causally connected in one of these appropriate ways with the fact that h, for the causal chain might be a very unusual one. For this reason, he adds another condition to his proposal that S must correctly reconstruct the "important links in the relevant causal chain(s).

Goldman claims that his analysis is strong than the traditional analysis, for the causal requirement and the correct reconstruction requirement were absent from the older ones. This additional requirement enables him to circumvent Gettier's counter-examples to the traditional one. But this analysis is weaker than the traditional analysis from another point of view. His theory does not require the justification condition of S's believing P. He thinks it is rather an
advantage of his theory. For many things which cannot be known by the justified-true-belief analysis of knowledge, can now be very well known by his theory.

HARMAN'S OBJECTION

Gilbert Harman raises two objections against Goldman's proposal. In the first place, Goldman's account of knowledge is intended to be fully general; it is intended to give an account of knowledge for any S and h. But this causal schemata do not include knowledge of universal propositions. 'All men are mortal' is a universal proposition, but our belief in this proposition does not seem to be causally connected with the fact that all men are mortal, for this fact is not the cause of anything. Goldman thinks that this case can be covered if logical connections are included among the links of appropriate causal chains. But this suggestion seems to Harman to be both ad hoc and counter-intuitive. In the second place, Goldman's requirement that S must correctly reconstruct the important links in the relevant causal chains is too vague. Two things are not clear. (1) What links are the important ones? (2) In what sense must S reconstruct those links? These problems cannot be solved by Goldman's theory.
HARMAN'S SUGGESTED IMPROVEMENTS

Harman tries to amend the theory of Goldman by converting it into a theory of inference. As a first approximation, he takes Goldman's remark about causal connections literally, forgetting for the moment that they include logical connections. Then he changes his causal theory of knowing into the theory that inductive conclusions always take the form $X$ causes $Y$, where further conclusions are reached by additional steps of inductive or deductive reasoning. He suggests that we can give a better account of inference if we replace "Cause" with "because". On the revised account, we infer not just statements of the form $X$ causes $Y$ but, more generally, statements of the form $Y$ because $X$ or $X$ explains $Y$. Inductive inference is conceived as "inference to the best of competing explanatory statements". Inference to a causal explanation is a special case. He claims that the revised account is more consistent with ordinary usage. An observer infers that certain mental states best explain someone's behaviour; but such explanation by reasons might not be causal explanation. Secondly, Harman thinks that Goldman's ad hoc treatment of knowledge of generalizations can be avoided by the transmutation from "cause" to "because". He says,
"Although there is no causal relation between a generalization and those observed instances which provide us with evidence for the generalization, there is an obvious explanatory relationship: That all emeralds are green does not cause a particular emerald to be green, but it can explain why that emerald is green. And other things being equal, we can infer a generalization only if it provides the most plausible way to explain our evidence.

COLLIER'S COUNTER-EXAMPLE AGAINST GOLDMAN'S THEORY

Collier offers a counter-example to the causal analysis of knowledge and shows that the theory of Goldman is subject to this counter-example. The counter-example is stated below:

"Suppose that unbeknown to Smith I administer an hallucinogenie drug to him. Since he doesn't realize that he has been drugged, he believes that his hallucinations are real. But one of these hallucinations is that I gave him the drug that I, in fact, gave him, and in particular, he believes that his hallucination is real. In the face of this, it seems to me that the causal theorist must do one of two things. Either he must claim that Smith doesn't know this or that the causal connections have gone somehow awry."
Collier shows that the first alternative is not very promising, so he considers the second alternative that in the hallucinations the causal connections have gone awry. Now what could have gone awry depends on what one takes to be the causal connection required. Goldman says that "if a given event or state, in conjunction with other events or states, 'leads to' or 'results in' another state (or the same state at a later time), it will be called a 'cause of the latter'."

In Collier's counter-example, however, 'my-giving Smith the drug causes, in this sense, his hallucination and also his belief.' But then Goldman's theory is counter-examined.

**KLEIN'S OBJECTION TO GOLDMAN'S CAUSAL PRINCIPLE**

Goldman's causal principle is shown to be clearly incorrect by Peter Klein. This principle tells us that the mortality of all men causes S's belief in their mortality. But in the ordinary sense of cause, there seems to be no causal chain that can be traced from the mortality of all men to S's belief in it. So in the ordinary sense of 'cause', it is simply not true that S was causally affected by the mortality of all men. Klein points out that if we want to generalize this theory so as to include everything we know inferentially, we have to develop some rather ingenious ways of increasing the causal order of events.
The causal theorist may use the word 'cause' in a broader sense so that it can account for our knowledge of universal generalizations and mathematical and ethical propositions. Mark Steiner modifies and reformulates a Goldman-like causal theory in the following manner:

"One cannot know that a sentence S is true, unless S must be used in a causal explanation of one's knowing (or believing) that S is true."

Steiner further argues that this rephrasing is required and that every causal explanation must be imbedded in a theory that contains the axioms of number theory and its analysis. Now whether Steiner is correct or not, Klein points out that the suggested revision does not include the requirement suggested by Goldman. But without this requirement, the suggested revision could not distinguish those cases in which a belief was acquired in a suitably reliable manner from those in which it was acquired in a completely fortuitous manner. This could be remedied by requiring, as Goldman does, that the sentence S contains a designator of a causal progenitor of that belief that S is true. But a mathematical sentence does not contain one of the requisite designators in an ordinary sense of 'cause.' Klein says that we have to see whether a new and expanded sense of cause could be so encyclopaedic as to rob the causal theory of its explanatory power and
initial credibility. So his objections to Goldman's theory is based on some other ground. He shows that Goldman's analysis cannot avoid the difficulty involved in the following version of the Grabit case.⁹

"Suppose S sees a man walk into the library and remove a book from the library, by concealing it beneath his coat. Since S is sure that the man is Tom Grabit whom he has often seen before, S reports that he knows Tom Grabit stole the book. Suppose further that it was Tom who stole the book, that S's evidence is sufficient to justify the belief, and that the belief is appropriately caused; that is, Tom's stealing the book is appropriately causally connected with S's belief thereof. But now let us add to the account that, unbeknownst to S, Tom has a twin brother, John, who is a kleptomaniac and who was in the library on the day in question at the time Tom stole the book and that John stole a copy of the same book. In that case, although all the proposed necessary conditions of knowledge are satisfied, S would fail to know, since the belief is too fortuitous".¹⁰

Klein holds that what Goldman's theory does require is that, if S knows P inferentially, then all S's background beliefs must be true. It might be claimed that S did have a false background assumption in this case, namely 'I can
recognize Tom Grabit when I see him. Now if S could arrive 
at this belief that Tom stole the book only through such a 
false assumption, this would not be a counter-example. But S 
need not rely upon that or any other false background belief. 
S could believe that he had seen Tom Grabit in the past 
sufficiently often to know what Tom looks like and he had 
neither seen nor heard of anyone else who looks like Tom. Those 
beliefs, all true, justify the belief that it is Tom.

GOLDMAN'S THEORY OF NON-INFERENTIAL PERCEPTUAL KNOWLEDGE.

In 'Discrimination and perceptual knowledge', Goldman 
presents a theory of non-inferential perceptual knowledge 
which is a descendent of his earlier paper. Like his earlier 
threey, he tries to explain here the concept of knowledge by 
reference to the causal processes that produce (or sustain) 
belief. But unlike the earlier theory, however, it would not 
require that a knower's belief that P be causally connected 
with the fact or state of affairs, that P.

He gives an example in which Henry while driving in 
the countryside, tells his son by pointing to an object "That's 
a barn" with many other objects. Henry is very well acquainted 
with a barn, his eyesight is quite good and has enough time
to look at it reasonably carefully. It is also supposed that unknown to Henry, the district he has just entered is full of papier-mâché facsimiles of barns. They are actually just facades which have no back walls or interiors and cannot be used as barns. But they look exactly like barns from the road. So Henry can mistake a facsimile for a barn. This new information about the facsimiles prompts us to withdraw the claim that Henry knows the object is a barn.

Goldman shows that neither the traditional 'justified true belief' analysis of knowledge nor his own earlier theory can handle this problem. He also examines Unger's 'non-accidentality' thesis and the 'indefeasibility' theory but concludes that none of these theories can solve this problem. He then proposes the following treatment of the barn example.

"A person knows that P", he suggests, "only if the actual state of affairs in which P is true is distinguishable or discriminable by him from a relevant possible state of affairs in which P is false. If there is a relevant possible state of affairs in which P is false and which is indistinguishable by him from the actual state of affairs, then he fails to know that P". Goldman says that the information about the facsimiles provides such a relevant state of affairs. Given that the district Henry has entered is full of barn facsimiles,
there is a relevant alternative hypothesis about the object, viz., that it is a facsimile. If we assume a state of affairs in which such a hypothesis holds is indistinguishable by Henry from the actual state of affairs, this hypothesis is not ruled out by the factors that confirm Henry's belief. So if we are apprised of the facsimiles in the district, we are inclined to deny that Henry knows.

Goldman explains the qualifier 'relevant' in the following way:

"If knowledge required the elimination of all logically possible alternatives, there would be no knowledge (at least of contingent truths). If only relevant alternatives need to be precluded, however, the scope of knowledge could be substantial. This depends, of course, on which alternatives are relevant."  

In defending his analysis of perceptually knows, Goldman discusses some particular examples and in treating these examples he assumes some (psychological) regularities concerning the selection of alternatives. Among these regularities is the fact that speakers do not ordinarily think of "radical" alternatives, but are caused to think of such alternatives, and take them seriously, if the putative knower's circumstances call attention to them. Since he assumes that radical or unusual alternatives are not ordinarily entertained or taken seriously, his theory may appear to side with the
opponents of skepticism. His official analysis, however, is neutral on the issue of skepticism.

Goldman's definition of perceptual equivalence helps him to analyse the notion of perceptual knowledge. A perceptual equivalent of an actual state of affairs is a possible state of affairs that would produce the same, or a sufficiently similar, perceptual experience. Perceptual equivalence is defined in the following manner:

"If object \( b \) has the maximal set of properties \( J \) and is in \( \text{DOE} \) relation \( R \) to \( S \) at \( t \), if \( S \) has some percept \( P \) at \( t \) that is perceptually caused by \( b \)'s having \( J \) and being in \( R \) to \( S \) at \( t \), and if \( P \) noninferentially causes \( S \) to believe (or sustains \( S \) in believing) of object \( b \) that it has property \( F \), then

\[ c, k, R^* \text{ is a perceptual equivalent of } b, J, R \text{ for } S \text{ at } t \text{ relative to property } F \text{ if, and only if:} \]

1. If at \( t \) object \( c \) had \( k \) and were in \( R^* \) to \( S \), then this would perceptually cause \( S \) to have some percept \( P^* \) at \( t \),
2. \( P^* \) would cause \( S \) noninferentially to believe (or sustain \( S \) in believing) of object \( c \) that it has \( F \), and
(3) P* would not differ from P in any respect that is causally relevant to S's F-belief.  

In order to understand Goldman's definition of 'perceptual equivalence' we have to get a clear idea about some concepts. Goldman says that perceptual equivalence must be relativized to persons (or organisms). S represents the person who has the percept P. Again, perceptual equivalence must be relativized to times. Perceptual discriminative capacities can be increased by training or experience, it can also deteriorate with age or due to illness. So S must have the percept P at a particular time t.

Now, perceptual states of affairs must be specified by ordered triples. Each of these ordered triples consists of (1) an object, (2) a maximal set of nonrelational properties, and (3) a DOE relation. b, J, R is an ordered triple in which b stands for an object, J stands for a maximal set of non-relational properties and R stands for a DOE relation. According to Goldman, "a maximal set of (nonrelational) properties is a set which would characterize an object completely (at a single time) in some possible world." Here he has in mind purely qualitative properties. DOE relation is an abbreviation of the notion of a distance - orientation - environment relation. First, Distance is one relation that can...
affect the percept. Secondly, the nature of the percept depends, for example, on which side of the object faces the perceiver, and on how the perceiver's bodily organs are oriented, or situated, vis-a-vis the object. Thirdly, the current state of the environment affects the percept. So DOE relation is a conjunction of relations or properties concerning distance, orientation, and environmental conditions.

\( c, K, R^* \) is also an ordered triple where \( c \) stands for an object, \( K \) stands for a maximal set of nonrelational properties, and \( R^* \) stands for a DOE relation. \( c, K, R^* \) represents an alternative state of affairs, which may (but need not) differ from \( b, J, R \) with respect to one or more of its elements. Goldman asks, "Under what conditions is an alternative \( c, K, R^* \) a perceptual equivalent of \( b, J, R \) for person \( S \) at time \( t \) ?" His solution is as follows:–

"If the percept produced by the alternative state of affairs would not differ from the actual percept in any respect that is causally relevant to \( S \)'s belief, this alternative situation is a perceptual equivalent for \( S \) of the actual situation."^{15}

There are some notions in the definition of perceptual equivalence which Goldman takes for granted, e.g., the notion of (perceptual) \( \text{de \ re} \) belief, the notion of perceptual
causation and the notion of a (noninferential) perceptual belief or perceptual "taking". First of all, he assumes that the object of which a person perceptually believes a property to hold is the object he perceives i.e., the object that perceptually causes the 'ethics of belief'. Secondly, a person's percept must be caused by many objects and events, but the person does not perceive all of these objects and events. Thirdly, only beliefs that are directly (noninferentially caused by a percept can be considered as perceptual beliefs or perceptual takings. But "indirectly" caused beliefs would not be considered as perceptual takings.

Another notion which is yet to be considered and explained is the property F. Goldman says that the relativization to F (in the definition) implies that an F-belief is produced in both the actual or the alternative state of affairs. If we apply the definition to putative knowledge, we can show cases where F belongs to J (so S's belief is true in the actual situation) but does not belong to K (so S's belief is false in the counterfactual situation). But the definition of perceptual equivalence does not tell us whether F-property belongs to J or K, i.e., whether F is exemplified in either the actual or the alternative states of affairs.
Goldman speaks of one implication of this definition.

"...there is no temporal gap between each object's having its indicated properties and DOE relation and the occurrence of the corresponding percept...... The intervals in the actual and alternative states may differ because the stimuli might be at different distances from the perceiver." 16

After giving the definition of 'perceptual equivalence', Goldman proceeds to analyse the notion of the perceptual knowledge. He proposes the following (tentative) analysis of perceptual knowledge:

"At t S noninferentially perceptually knows of object b that it has property F if, and only if :

(1) for some maximal set of nonrelational properties J and some DOE relation R, object b has (all the members of) J at t and is in R to S at t,

(2) F belongs to J,

(3) (A) b's having J and being in R to S at t perceptually causes S at t to have some percept P,"
(B) P noninferentially causes S at t to believe (or sustains S in believing) of object b that it has property F, and

(C) there is no alternative state of affairs c, K, R* such that

i) c, K, R* is a relevant perceptual equivalent of b, J, R for S at t, relative to property F, and

ii) F does not belong to K. ¹⁷

One new concept, e.g., 'relevant perceptual equivalent' is introduced in this definition. Other concepts have been explained earlier. Whether a perceptual equivalence is relevant is determined not only by the hypothetical object and its properties, but also by the DOE relation. If the DOE relation is "unusual", this will not count the alternative as relevant. According to Goldman's analysis, our knowledge is defeated in alternative situations in which the DOE relation differs from the DOE relation in the actual state of affairs.

The first two conditions (Conditions 1 and 2) jointly supply the truth condition for knowledge. "S knows b to have
F (at t) only if b does have F (at t)." The belief condition is given by condition 3B which is restricted to (noninferential) perceptual belief. Condition 3C plays the most important role. According to this condition, there would be no relevant alternative that is "(i) a perceptual equivalent to the actual state of affairs relative to property F, and (ii) a state of affairs in which the appropriate object lacks F (and hence S's F-belief is false)."

Now, Goldman has to relate this analysis to his notion of a "reliable discriminative mechanism". He thinks that a man who perceptually knows something is a two-part mechanism each of which must be sufficiently discriminating. If the first part which constructs percepts from receptor situation is not sufficiently discriminating, patterns of receptor stimulation from quite different sources would give us the same (or very similar) percepts that would produce the same beliefs. If the second part which operates on percepts to generate beliefs is not sufficiently discriminating, then even if different percepts are constructed by the first part, the same beliefs will be produced by the second part. Thus an undiscriminating bipartite mechanism can generate a belief which may be true by sheer luck; but in counterfactual situations, such a belief would be false. Goldman's analysis brings out the point that "S has perceptual knowledge if and only if not only does his perceptual
mechanism produce true belief, but there are not relevant
counterfactual situations in which the same belief would be
produced via an equivalent percept and in which the belief
would be false."

Goldman shows the application of the above analysis of
'perceptual knowledge' to the barn example (where there are
facsimiles in Henry's district) in the following manner:

"Let S = Henry, b = the barn Henry actually sees, and
F = the property of being a barn. Conditions 1 through 3B are
met by letting J take as its value the set of all nonrelational
properties actually possessed by the barn at t, R take as its
value the actual DOE relation and P take as its value the
actual (visual) percept caused by the barn. Condition 3C is
violated, however; There is a relevant triple that meets
subclasses (i) and (ii), i.e., the triple where c = a suitable
barn facsimile, k = a suitable set of properties (excluding,
of course, the property of being a barn), and R* = approxi-
mately the same DOE relation as the actual one. Thus, Henry
does not (noninferentially) perceptually know of the barn that
it has the property of being a barn."
But still this analysis faces difficulties in Gettierized cases as shown by Marshall Swain and Gilbert Harman and recognized by Goldman himself. There are other more serious difficulties. He adds a very vague condition to the previous conditions to complete his analysis by resolving the problems.

"(4) S's propensity to form an F-belief as a result of percept P has an appropriate genesis." 19

If the genesis is merely fortuitous or accidental, it cannot support knowledge. Goldman admits that this addition is not enough to resolve the problem fully. He says that the best he can do is to identify the problem. However, the notion of an "appropriate genesis" remains unexplained. But without a satisfactory explanation of this notion, his theory cannot get rid of the difficulties which it has to face. It gives us an account of knowing in ordinary perceptual cases but not in Gettierized cases. Moreover, this theory is inapplicable in cases of inferential knowledge. So in case of inferential knowledge, the same old problems still hold.

SECTION - II SWAIN'S THEORY

Marshall Swain proposes a causal theory of knowing
which is intended in part as an improvement on Goldman's theory. He distinguishes between two types of knowledge about the world, e.g., basic and non-basic knowledge. Basic knowledge is not dependent, from the point of view of justification, on other knowledge, but non-basic knowledge is dependent on other knowledge. Swain, however, has not explained clearly the nature of basic knowledge. He only gives an elaborate analysis of non-basic knowledge. Lehrer and Paxson in their article analyse the concept of basic knowledge. According to them, "if a man knows that a statement is true even though there is no other statement that justified his belief, then his knowledge is basic." Some philosophers have suggested that certain memory and perceptual beliefs are basic in the sense explained above. On the contrary, if a man knows that a statement is true because there is some other statement that justifies his belief, then his knowledge is non-basic. Thus it seems clear that basic knowledge is self-justifying but non-basic knowledge depends for its justification on some other knowledge. Whether there is some self-justifying statement is a question that has given rise to much controversy between the foundationalists and the non-foundationalists. I will take up this problem later.

Non-basic knowledge, according to Swain, is of two types: primary and secondary. Primary non-basic knowledge is knowledge of specific events and states of affairs in the world.
For example, we know that there is a table in front of us.
Secondary non-basic knowledge is knowledge about the world but this is not knowledge of specific events and states of affairs. For example, we know that all men are mortal. Both of these types of non-basic knowledge are genuinely empirical. His definition of non-basic knowledge is stated below.

"(K) S has non-basic knowledge that p if, and only if

(i) P is true;
(ii) S believes that P;
(iii) S's justification renders P evident for S;
(iv) There is no special counter-evidence such that q defeats S's justification."^{22}

Now he argues that with respect to primary non-basic knowledge, the defeasibility condition can be replaced by conditions that refer to facts about the causal connections and which obtain between a man's evidential beliefs and the events or states of affairs about which he has knowledge. Swain advances the following Gettier-like counter-example to condition (iv) stated above.
Suppose that S looks into a field and sees an object which looks like a sheep. Besides he hears bleating noises and gets the sheep-like odors in the air etc. In fact, there is a sheep in some far corner of the field where S cannot see. The object S sees is a cement replica of a sheep placed in the field by the farmer for decorative purposes. Thus S has a true belief that there is a sheep in the field and his justification renders this evident for him. So condition (i), (ii) and (iii) are satisfied, yet S does not know that there is a sheep in the field, for his justification is defective. In the present case, there is some special counter-evidence q, namely, "S does not see a sheep, but rather a cement replica of one" such that q defeats the justification of P. Hence condition (iv) of (K) is not satisfied.

Swain speaks of a causal condition that could replace (iv) in (K) and would give exactly the same result.

This condition is as follows:

"(iva) The causal chain leading to S's belief in e contains the event or the state of affairs referred to by P."23

But Swain says that sometimes we have knowledge of specific events or states of affairs even though our evidential
beliefs are not caused by those events or states of affairs. He proves this by the following example.

"Suppose that you have set about blasting a hole in the side of a mountain. You have planted TNT in the appropriate place, and have wired the TNT to a detonator box. The detonator box has a timer on it. Having carefully checked the wiring, the batteries, and the TNT, you set the timer, remove yourself to a safe distance, and wait for the explosion that you know will occur. Before the occurrence of the explosion, it seems clear that you can be said to know it will occur, and even when it will occur. However, the above conditions of knowledge, with condition (iva) replacing (iv), are not satisfied, because the event referred to by P (the future explosion) is not a member of the causal chain leading to your evidential beliefs. It could hardly be so, since it has not occurred yet."\(^{24}\)

So Swain revises condition (iva) in the following way:

"(ivb) The causal chain leading to S's belief in e either (1) contains the event or state of affairs referred to by P, or (2) contains some other event that is also a member of the causal chain leading to the occurrence of the event referred to by P."\(^{25}\)
Condition (ivb) allows us to say that S knows that P. The resulting conditions are similar in some respects to the causal theory of knowledge put forward by Goldman. The difference between Goldman's proposal and (ivb) is that Goldman's analysis covers all cases of empirical knowledge including what Swain calls "secondary" non-basic knowledge.

Whatever it may be, Swain distinguishes two basic types of causal chains that can enter into a cognitive situation, and these two basic types are reflected in parts (1) and (2) of conditions (ivb). But Brian Skyrms has raised the following counterexample against analyses that involve clauses formulated in the manner of (ivb).

Suppose that we find a dead man lying in the gutter with his head cut off from his body. From this we come to believe that the man is dead on the basis of our evidence that his head is cut off from his body. But Skyrms thinks that it may be the case that the man actually dies of heart attack and after this, a mad man came along and severed his head from his body. In this case, even though we know that he is dead, condition (ivb) is not satisfied because there is no event in the causal chain leading our belief that his head has been cut off from his body which is also in fact causally
responsible for his death, nor is his being dead causally responsible for our belief that his head has been cut off from his body.

In order to allow for knowledge in situations of this sort, Swain replaces (ivb) with (ivc).

"(ivc) The causal chain leading to S's belief that e either (1) contains the event or state of affairs referred to by P, or (2) contains some other event or state of affairs that is causally sufficient for the occurrence of the event referred to by P."²⁶⁷

But there is a class of cases which are similar in structure to Skyrms's example and which condition (ivc) cannot overcome.

Suppose, for instance, S witnesses a marriage ceremony and his evidence is logically sufficient for the truth of the statement, for example, 'Bob and Sally are getting married.' But it may be the case that they were married previously in some informal way and this marriage ceremony is just a show before others. But if we replace (ivc) with the following we shall be assured of knowledge in situations of
Swain imagines a situation just like the first of the above counter-examples (the example of the perception of the sheep in the field) the difference only being that instead of the cement replica, here S sees a very cleverly engineered television image of a sheep which projects a real sheep in some far corner of the field where S cannot see. Here conditions (i), (ii), (iii) and even condition (ivd) is satisfied, though unhappily. For in the present case the state of affairs referred to by P (there is a sheep in the field) is a member of the causal chain leading to S's evidential belief that he seems to see a sheep in the field. This yields the result that S knows there is a sheep in the field, which is unsatisfactory.

Swain thinks that the vague term 'special defeating counterevidence' should be dropped and (ivd) will be supplemented by the following condition:
There is no true statement q such that q in conjunction with S's evidence E fails to render P evident for S and such that q is true because of events in the causal chains referred to in (ivd).”

Swain adds clause (v) to specify the conditions under which there might be 'special defeating counter-evidence.' Thus (v) functions as a defeasibility component in analysis (K).

This completes the list of conditions that Swain offers as an analysis of our knowledge of specific events and states of affairs. The final set consists of (i), (ii), (iii), (ivd) and (v). And the explication of (K) is to be revised to read 'S has primary nonbasic knowledge' by attempting to ward off some potential misunderstandings.

Now Swain tells us some important points about his analysis. First, this analysis will also apply in cases where we have knowledge of events that occurred either long ago or far away. In these cases, the causal chains connecting those events and experienced events that provide us with our crucial evidence will be erroneously complicated. This complexity need not prevent us from knowledge, however, unless the causal chains involved contain events that provide
Secondly, a man may fail to have knowledge not only in cases in which there is some peculiarity in the causal chain connecting his crucial evidential beliefs with the event in question, but also in cases where the causal chain involved is quite normal and uncomplicated because one's justification is not strong enough. This point is closely related to the first. Just as it is true that causal complexity and evidential strength are functionally related, it is also true that knowledge of specific events and states of affairs is a function of both causal and epistemic considerations, and chains to knowledge can be vitiated by defects of either type.

Finally, though Swain's analysis requires that certain causal connections are necessary in order to have knowledge, one need not necessarily know this causal connection. That is to say, for Swain, in the real world, knowing something does not imply knowing that one knows, though in the ideal world it may be the case.

Thus we see that the theory of primary nonbasic knowledge presented in this paper attempts to combine causal
and defeasibility considerations, the idea being that whether a person's justification is defeasible or indefeasible is dependent upon considerations concerning the causal chains involved in the ancestry of his evidential beliefs.

**PAXSON AND TOLLIVER'S ATTACK ON SWAIN'S THEORY**

Thomas Paxson attacks the defeasibility clause by providing counterexamples to the condition formulated by Swain. He shows that Swain's own example about blasting a hole in a mountainside seems to provide a counterexample to his analysis of primary non-basic knowledge.

"Suppose Smith plants TNT in a hole in the side of a mountain, wires it to a detonator with a timing mechanism, sets the timer for thirty minutes, and withdraws to watch the spectacle. Suppose also that the explosion occurs on schedule.

Now Smith believes that $P$, the TNT will explode at $t_{30}$, '$P$' is true, and his justification renders $P$ evident for Smith. Conditions (i) to (iii) are satisfied. Further, the causal chain leading to $S$'s belief in $e$ contains some other event or state of affairs which is, in the context of one
evidence possessed by S, causally sufficient for the occurrence of the state of affairs referred to by 'P'. However, unknown to Smith, one of the two wires running to the TNT breaks, is gnawed through or whatever (and here I let you construct the example to your liking) and the two ends fall either (1) into a small pool of brine or (2) onto a small piece of steel or anything else that you wish so that the circuit is fortuitously completed once again. Now, there is a true statement, q such that q in conjunction with S's evidence E fails to render P evident for Smith, namely that one of the wires which Smith used to complete the circuit connecting the timer, detonator, and TNT, breaks at some time $t_{30} - r$. However, it is false that q is true because of events in the causal chain leading to Smith's belief in his evidence or because of events in the causal chain which, in the context of the evidence possessed by Smith, renders some event or state in the first chain causally sufficient for the explosion at $t_{30}$. Thus condition (ivd) and (v) are satisfied even though Smith does not know that the explosion will occur at $t_{30}$. His evidence has been defeated by q. But Paxson thinks that no q can be found that will defeat $e$ according to (v). Paxson suggests the following condition (v/) which removes
the defect of (v).

"(v/) There is no true statement 'q' such that 'q' in conjunction with S's evidence E fails to render 'P' evident for S and such that either q is true because of events in the causal chains referred to in (iv) or because events in the causal chain actually yielding P."31

Paxson thinks that we can account for the breaking of the wire as an element in the causal chain which led to the occurrence of p. But he sees that if we strengthen Swain's analysis by replacing condition (v) with condition (v/) it will become too strong. The following counterexample shows this.

"Suppose that Robinson, seeing a farmer pointing to the field, looks, and sees something distinctly sheep-like, hears bleating noises, and so forth. As a result he comes to believe correctly that there is a sheep in the field right there, that what he sees is in fact a sheep."32 So conditions (i) to (ivd) are satisfied. But Swain further assumes that the farmer who pointed to the sheep in the field was actually chatting with a city-slicker and tells him that it is/mechanical ram made of wood, covered with wool and
fitted with an electronic bleater. Robinson could not overhear the conversation because he was far away from the farmer. But he was not so far away from the sheep that he could confuse it with another familiar farm animal. Thus it seems to Paxson that Robinson knows that there is a sheep in the field and the farmer's idle talk with the city-slicker does not prevent him from knowing. But on Swain's analysis, this prevents him from knowing. For the farmer's pointing to the artificial ram is causally responsible in part for Robinson's seeing the sheep. But at the same time, the farmer's pointing was an integral part of the testimony whereby he wanted to mislead the city-slicker. So the farmer's misleading talk fails to render it evident to Robinson that there is a sheep in the field. That is why Swain's analysis now becomes too strong.

Joseph T. Tolliver presents an example in which Swain's condition as well as Goldman's are satisfied, but the person in question does not have knowledge.

Suppose S is a hunter who discovers some tracks on the ground which he believes by hundred past observational evidence to be tracks left by deers. From these, S believes that,

"(e) these tracks are deer tracks."^{33}

Now by following the tracks S enters into a thicket and
behind it he hears some noise. On the basis of these observations and e, S concludes that

"(p) The animal behind the thicket made these tracks and it is a deer."34

Tolliver supposes p to be true but also that, unknown to S, there exists a strange type of animal (existing in large numbers far exceeding the number of deers). But they are very timid and do not come out before anybody. Their special feature is that they leave tracks that are exactly similar to deer tracks. He, however, supposes that

"(r) Ninety-nine percent of tracks that look like the ones observed by S are in fact left by those strange animals."35

This is a case where p is true, S believes that p, S's evidence reduces P evident for S, the causal chain C leading to S's belief that e contains some other state of affairs referred to by 'P', and there is no true statement q such that q in conjunction with S's evidence fails to render P evident for S and such that q is true because of events in the causal chains referred to in (ivd). Thus all conditions proposed by Swain are fulfilled here, but still S does not know that P. S is clearly
justified in believing that a deer left the tracks, for he is warranted in making a singular predicative inference of the form: "(I) One hundred percent of observed A's are B's (and many A's have been observed); therefore, this A is B."

But the person in question does not know by means of an inference of type (I) if a sentence of the form (T) is true.

"(T) Ninety-nine percent of A's are not B's."

Thus Swain's analysis (K) is proved by Tolliver to be too weak.

**AN IMPROVED VERSION OF SWAIN'S THEORY**

Both Paxson and Tolliver point out that when a person has evidence which justifies a belief, there will almost always be some additional evidence that the person does not possess. In an improved version of his theory, Swain calls any fragment of unpossessed evidence which has this characteristic undermining counterevidence. He admits that the conditions prescribed in KCJ (here he refers to his earlier theory as KCJ) fail to adequately take the important distinction between defeating and merely undermining counterevidence into account.
Swain tries to modify this situation by introducing another distinction between a defective and a nondefective causal chain with respect to a particular justification. A defective causal chain provides undermining counterevidence, but a non-defective causal chain does not provide such counterevidence. Now he replaces conditions (ivd) and (v) of (K) with the following single condition (iv*). In this condition, he uses capital letters 'P', 'L' and so forth for names of the specific events or states of affairs referred to by 'P', 'L' etc., 'BSe' is used to designate the state of affairs of S's believing that e.

"(iv*) where 'e' designates the portion of S's total evidence E that is immediately relevant to the justification of P, either

(A) there is a nondefective causal chain from P to BSe;

(B) there is some event or state of affairs Q such that

   (i) there is a nondefective causal chain from Q to BSe; and

   (ii) there is a nondefective causal chain from Q to P;

   Or

(C) there is some event or state of affairs H such that

   (i) there is a nondefective causal chain from H to BSe; and
(ii) $H$ is a nondefective pseudo-overdeterminant of $P$.37

The conditions for defectiveness are stated in (D). In this condition, Swain uses 'X' and 'Y' as variables for event names and a solid arrow $\rightarrow$ to designate a causal chain. So $X \rightarrow Y$ will take names of causal chains from $X$ to $Y$.

"(D) Where $S$ justifiably believes that $P$ on the basis of evidence $e$, causal chain $X \rightarrow Y$ is defective with respect to this justification if (a) there is some event or state of affairs $U$ in $X \rightarrow Y$ such that $S$ would be justified in believing that $U$ did not occur and (b) it is essential to $S$'s justifiably believing that $P$ on the basis of the evidence $e$ that $S$ would be justified in believing that $U$ did not occur."38

In Swain's televised sheep example, (D) gives us the result that the causal chain from the sheep to BSe is defective with respect to $S$'s believing that there is a sheep in the field. In Paxson's example, $S$ directly sees a sheep and knows that there is a sheep. So the causal chain from the sheep to BSe is nondefective. Here the undermining counter-evidence is constituted by the event of the farmer's chatting with the city-slicker that it is an artificial ram. But Tolliver's example cannot be handled simply by the conditions for defectiveness presented in
(D), for those conditions will not give us the result that the hunter does not know. Swain therefore tries to discover another way in which a causal chain can be defective with respect to a justification. For this he introduces the idea of an 'alternative causal chain' and explains this in the following manner:

"(CA) C* is an alternative to causal chain X→Y with respect to Y if and only if:

(i) C* is exactly like X→Y except that for some event Z, or set of events Z₁ Z₂ .... Zn, which are in X Y, there is instead some event Z* or set of events Z₁* Z₂* .... Zm* in C*, and

(ii) had C* occurred instead of X→Y, then Y would still have occurred, and would have been an effect in C.*"39

In Tolliver's example, if the 'clever little animals' instead of deers caused the tracks, then there would have occurred an alternative to the actual causal chain Q→BSe that resulted in the hunter's having his evidence. So a causal chain can be defective with respect to a justification if there be some alternative of this sort to that causal chain. Swain
names alternatives of this sort "Significant alternatives". He analyses a 'significant alternative' in this way.

"(S) C* is a significant alternative to X —→ Y with respect to S's justifiably believing that P on the basis of evidence e if:

(a) it is objectively likely that C* should have occurred rather than X —→ Y; and

(b) if 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 P if S were justified in believing that U occurred."

Swain holds that this is only a partial explication of significance, for it is not clear that the objective likelihood of an alternative is necessary for significance. But at present he is unable to give a complete account of significance. So he gives a full explication of defectiveness with this partial explication of the notion of significance.

"(D*) Where S justifiably believes that P on the basis of e, causal chain X —→ Y is defective with respect to this justification if an only if :"
Either (I) (a) and (b) as in (D); or (II) there is some significant alternative $C^*$ to $X \rightarrow Y$ with respect to S's justifiably believing that $P$ on the basis of $e$.\textsuperscript{41}

Clause II of (D*) shows that $Q \rightarrow BSe$ is a defective causal chain in Tolliver's example.\textsuperscript{3} For there is an alternative to $Q \rightarrow BSe$ (e.g., that one of the strange animals causes the tracks) which is objectively likely. Now if that alternative causal chain had occurred, then there would have been a state of affairs $U$ (namely, the presence of the animal) such that if the hunter had been justified in believing that this state of affairs obtained, he would not have been justified in believing $P$. In the barn example, (given by Goldman) also, the causal chain $P \rightarrow BSe$ is defective because it also involves significant alternatives, although those alternatives do not qualify as significant in accordance with (S). Since there are many more barns around than there are facsimiles, it is not objectively likely that one of the alternatives to $P \rightarrow BSe$ should have obtained. However, these examples cover clauses (A) and (B) of (iv) and in both of them we get the appropriate result by (iv*) that S does not know that $P$. Now clause (c) of (iv) contains another notion, i.e., pseudo-overdeterminant which needs to be explained.
Before explicating the notion of a nondefective pseudo-overdeterminant, we have to make clear the idea of causal overdetermination. According to E. Loeb, cases of causal overdetermination occur when "two events, states of affairs, conditions, or objects seem to have an equal claim to having played some one causal role". Swain says, "in any case of causal overdetermination, two or more events or states of affairs are related to a single effect in such a way that, ceteris paribus, if either of them alone had occurred, then the effect in question would still have occurred." Causal overdeterminations, according to Swain, are of two types. A causal overdetermination is genuine when each of the overdetermining events is appropriately called a cause of the effect in question. On the contrary, a causal overdetermination is pseudo when one of the overdeterminants is not properly called a cause. The 'severed head case', and the 'marriage case' in KCJ were examples of pseudo-overdetermination. When one event X is a pseudo-overdeterminant of another event Y, there will be a nonactual chain from X to Y (this nonactual causal chain is designated by a dotted arrow, e.g. 'X→Y' which is an alternative to the actual causal chain W→Y, where W is an actual cause of Y. He gives the following definition of defective pseudo-overdeterminants:

"(DPO) For any event or state of affairs X and Y, X is a
defective pseudo overdeterminant of \( Y \) with respect to \( S \)'s justifiably believing that \( P \) on the basis of \( e \) iff:

If \( X \rightarrow Y \) had occurred, then the causal chain \( X \rightarrow Y \) would have been defective with respect to \( S \)'s justifiably believing that \( P \) on the basis of \( e \).

Swain gives an example where \( P \) is a pseudo-overdeterminant of \( H \) in accordance with \( (DPO) \). However, given (c) of \( (iv^*) \), he gets the correct result concerning knowledge.

The analysis of Swain's theory shows that he requires that there be a causal connection of an appropriate type between the event or state of affairs designated by \( h \) and \( S \)'s having his reasons for believing that \( h \). This differs from Goldman's theory in that it is \( S \)'s having his reasons, rather than \( S \)'s believing \( h \) that must be causally connected with the event or state of affairs designated by \( h \). Moreover, Swain restricts the scope of his analysis to primary knowledge, which is knowledge of specific events and states of affairs that can be parts of causal chains. This limitation avoids the problem concerning universal generalization and other propositions that do not fit in the causal mould, but it does so at the cost of leaving open the question of those propositions. He attempts to avoid the 'correct reconstruction' problem by adding a condition.
which requires that there not be any defeating counterevidence that is true because of events or states of affairs in the relevant causal chains involved in a given case. In his revised theory, he tries to modify his earlier proposals to meet the various problems confronting it. By distinguishing between defective and nondefective causal chain, he claims to solve some problems of his earlier theory. But in doing so, he introduces some new concepts such as 'significant alternative', 'nondefective pseudo-overdeterminant' etc. which do not seem to be very clear to Swain himself. He tries to clarify these new concepts with suitable examples. In spite of that, his revised theory becomes more complicated than his original theory. The problems of basic knowledge and secondary knowledge are, however, yet to explained.

SECTION - III : UNGER'S THEORY

Peter Unger's analysis of human factual knowledge is a form of the causal theory of knowing in terms the notion of non-accidentality. Armstrong, however, characterizes Unger's theory as a reliability theory. It seems to me that he thereby intends to distinguish it from the simple form of causal theory.

Unger rejects the idea that knowledge of most contingent matters must be based on experience. He states that the
following conditions is a logically necessary condition by which a man's belief in something can be an instance of knowledge.

"(12.1) For any sentential value of P, a man's belief that P is an instance of knowledge only if it is not an accident that the man's belief is true."\(^4\)

Gilbert Harman shows that this condition does not provide a necessary condition of knowledge. He says that the non-accidentality of the truth of a belief depends upon 'what considerations one has in mind as well as upon how one describes what is to count as the accident.' He points out that the plausibility of Unger's condition lies entirely in the fact that one can know only what is true. But non-accidentality of the truth of a belief depends on particular contexts. We can very well say of a particular person that relative to certain considerations it is no accident that his belief is true but relative to other considerations it is an accident that his belief is true. So non-accidentality cannot be regarded as a necessary condition of knowledge.

Afterwards, Unger himself realizes that speaking of man's belief as being an instance of knowledge is not very natural. Our main interest is to find out when a man might know that something is so and so and not when a man's belief might be an instance of knowledge. So he reformulates the
preceeding condition in the following way:

"(1) For any sentential value of P, (at a time t) a man knows that p if and only if (at t) it is not at all accidental that the man is right about its being the case that p." 46

According to the above condition, it is essential that we think of a man as knowing something at a certain time and say that at that time it is not at all accidental that he is right.

In his analysis of human factual knowledge, Unger claims a complete absence of the accidental regarding a certain relation concerning the man who knows and the fact known. He does not claim it as regards the occurrence or existence of the fact known nor as regards the existence or abilities of the man who knows. This condition is stronger than his earlier condition (12.1). He now formulates it in the following manner:

"(2) For any sentential value of p, a man knows that p if and only if it is not an accident that the man is right about its being the case that p." 47

Unger points out that justified-true-belief fails to
be knowledge as it is based on false grounds. The problem is, "Why is there/lack of knowledge on the part of the man whose justified-true-belief is, in a simple and straightforward way, deduced and based on grounds that are entirely false?" Unger says that with such a man, it is entirely accidental that he is right about the matter in question, but for him to know it must be not at all accidental that he is right about the matter. Thus consideration of purely probabilistic cases shows that his theory of human factual knowledge is more plausible than the justified true belief analysis of knowledge.

Unger was afraid that his analysis would be too weak if an example is put forward to show that at a certain time it might be not at all accidental that a man is right about its being the case that \( P \) and, even so, at the time he may not know that \( P \). The example given by him involves the fulfilment of a man's expectation about the future being brought about as a result of a man's having that expectation. He imagines that a powerful and intelligent person is firmly convinced that all of his dreaming friends' appropriate beliefs about the results of sports would be correct and that the man's conviction comes to be true, just as he knew that it would be so. In these cases of knowledge, we may say that the knower does not know
why he knows various things about the future, or at least he knows almost nothing about why he knows. For he is ignorant both of the agent who makes his knowledge possible and also of the fact or event from which we get an explanation of his knowledge. Unger, however, thinks that if this example is examined impartially and carefully, the apparent problem for his analysis of human factual knowledge will be resolved. He says that if the man in such an example believes that he knows and this belief is caused by the same process of dreaming as the belief which is supposed to represent knowledge on the part of the man, then there is no good reason for denying that the man knows that he knows, though he may not have complete knowledge about why he knows. Unger, however, says that in fact, we do not know why the man knows except that 'a powerful agent makes it happen that at the relevant time it is not at all accidental that the man is right.'

Unger's non-accidentality thesis does not seem to me to be a satisfactory theory of knowledge, for there may be many cases where a man is non-accidentally right about something, but he cannot be said to know it. Unger's own example of 'dreaming friends' resolve' about the outcome of some 'sporting events' proves this. In cases of empirical knowledge, it is arguable whether a complete absence of the accidental is possible. Unger only claims that there will be complete absence
of the accidental but has not proved it. It is not at all clear how do we know that a powerful agent makes it happen that 'at the relevant time it is not all all accidental that the man is right.' Other philosophers have criticized Unger's theory from different points of view. Some of these criticisms have been discussed below.

**COLLIER'S CRITICISM**

Collier's counterexample (stated above in connection with Goldman's theory) is also applicable to Unger's theory. We have seen that in this counter-example the second alternative open to the causal theorist is to show that the causal connections have gone somehow awry. Collier suspects that in the case presented by him, the only place where the thing can go wrong is by its being accidental that Smith has the hallucinations that he in fact had. But he supposes that Smith is already paranoid and thus any hallucination that he might have is very probably of someone try 'to get' him, and he supposes further that he has recently been talking to Smith about drugs and their harmful effects on people. In such a situation, Collier's intuitions tell him that in fact it is 'not at all accidental' that Smith hallucinates that he has drugged him. Unger does not tell us when it is accidental that P is the case. So Collier's 'intuitive understanding of
the notions" tell him that Unger has been counter-exampled.

**BARKAR'S OBJECTION**

John A. Barker says that both Unger and Goldman fail to solve the Gettier problem, because they fail to do the following:

"First, take a case of X's being non-accidentally right or of X's belief being appropriately causally connected with the fact", and deduct the truth of the relevant proposition, calling the remainder"quasi-knowledge". Secondly, "let x correctly infer some true conclusion from the proposition. We have to ask the question whether x has quasi-knowledge of the true conclusion. If so, it follows that 'x is non-accidentally right' about the conclusion, or that "x's belief is appropriately connected with the fact." 49.

According to Barkar, neither Goldman nor Unger has explicated the nature of inference. They have adopted the recursive approach of simply specifying the ways in which correct inference is to be considered as extending knowledge out from basic knowledge. Gilbert Harman has pointed out that the problem of the nature of knowledge and correct inference are so interwined that they must be analysed together.
Holland explains Unger's thesis in the following way. First, a man being right consists, at least very often, in his holding a true belief. Secondly, it is not at all accidental that a man's belief is true if and only if there is a complete explanation for the fact that it is true. Thus according to Halland's interpretation, Unger's theory states that a man's belief enjoys the status of knowledge if and only if there is a complete explanation for the fact that it is true.

Holland, however, points out that the general principle by which Unger's crucial proposition is captured is obscure. On the most obvious interpretation of the argument it is held that we are non-accidentally right because we cannot help being right. This suggests a general principle of the form:

"It is not accidental that a is F if a cannot help being F." Holland shows that this principle is not compelling. If something cannot be helped it does not follow that it is not an accident. He explains this with the help of an analogy. He says that a non-accidental meeting between two people, for example, A and B, is in an important way, analogous to a person's belief being non-accidentally right. A's being at a particular place at a particular time equates with a person's
holding a particular belief and B's being at the place in question at the time in question equates with a certain state of affairs obtaining. And just as, if B is there, though A cannot help but meet him, it does not follow that their meeting is non-accidental, so, if what is believed is true, though the person cannot help but be right, it does not follow that his being right is non-accidental. What the analogy suggests is that, just as there needs to be an explanation for the meeting as such, viz., that it was pre-arranged, if the meeting is to be non-accidental, so there must be an explanation for the correspondence between belief and fact as such, if a person is to be non-accidentally right. Moreover, the analogy tells us something of what it means for there to be an explanation for the correspondence between belief and fact as such, i.e., an explanation for the fact that a man's belief is true. It tells us this: the way the world works must be so 'arranged' that in the right circumstances the man's believing that P causally suffices for P's being the case, and P's being the case causally suffices for the man's believing that P.

Holland asks whether there are in fact features of our perceptual situation which will count as yielding such a complete explanation for the correspondence between belief and fact. He says that if the circumstances are 'favourable' i.e., if there are circumstances in which beliefs are guaranteed to
match the facts, when it is tempting to suggest that where these circumstances do obtain, and issue in a true belief, then it is not an accident that we are right. For there seems now to be an explanation for the correspondence between belief and fact as such. The explanation is that human physiology and psychology is constituted so as to issue in beliefs which match the facts when confronted with them under certain conditions. Thus it appears that, as was required, the world is so ordered that, in the right circumstances, a man's believing that \( P \) causally suffices for \( P \) 's being the case, and \( P \)'s being the case causally suffices for a man's believing that \( P \).

But then he cites some cases in which though the circumstances are favourable, the persons in question are still somewhat lucky to be right in their resulting perceptual beliefs. So he adds another condition to the condition previously mentioned for our beliefs about the material world to be non-accidentally right. That is, our beliefs should typically be generated by our perceiving material objects in circumstances which are also otherwise favourable. Holland supposes that when our perceptual beliefs are so generated, there is a complete explanation for the explanation for the correspondence or 'match' between fact and belief.
HOLLAND'S CRITICISM AGAINST THIS CONCLUSION

Holland, however, shows that this comfortable conclusion may face two types of difficulties.

The first and lesser difficulty arises from the existence of situations which are essentially ambiguous from a perceptual point of view. In ambiguous situations, even though no unfavourable circumstance is present, a man may believe, for example, that a room is rectangular. This means that his believing that P does not, even in favourable circumstances, guarantee that P. But this difficulty can be accepted up to a certain limit. "Given that we inhabit the familiar material world, then even given favourable circumstances, it may not be possible for us to know our true situation in that world. But it is arguable that given a sufficiently varied contact with a living and moving material world, any ambiguities inherent in situations when regarded as 'wooden' isolation will as a matter of fact usually be resolved. The question, again, seems to be entirely an empirical one, and the facts adduced simply do not support the conclusion that any of the ambiguities inherent in a situation when taken in isolation would actually be sustained through a period of sufficiently varied contact with our surroundings."
The greater difficulty is that even in favourable circumstances the fact that \( p \) does not always guarantee a man's believing that \( p \). Even in those normal cases where true beliefs result from confrontation with familiar objects, the character of these beliefs will not depend essentially on the way the world is. It will depend in part upon the character of our antecedent convictions. But our being right turns out to be, after all, something of an accident, for we are unable to presume the existence of a 'match-ensuring' process. Holland says that whether or not it is a genuine difficulty, it must, at least in principle, be admitted. He further says that if the difficulty is admitted, it must however be made subject to an important qualification. "Suppose that the man who confronts the variety of familiar objects in the most favourable of circumstances has the normal and familiar antecedent convictions. Then if the man confronts a clock, there is a (causal) guarantee that he will believe he confronts a clock and not, say, an umbrella. That is to say, we believe that the world works in such way as to ensure that a man will hold one or other particular belief from a certain range of beliefs, even though the range itself is determined by antecedent conviction."

According to Holland, the correct position is this. It is not possible for us to know that the familiar material world exists, even though as a matter of fact it does. But we can
always know which familiar objects we confront, presuming that we do not confront such objects in familiar situations. The conclusion of Holland's enquiry, therefore, constitutes a compromise with scepticism.

J. L. Mackie claims that Unger's formula sets out the most minimal conditions possible for knowledge. This claim can be supported, in particular, by the reflection that even artefacts such as weighing machines, and watches can be non-accidentally right. But Holland argues that being right, for a human being, might involve something very different from what being right involves in the case of a watch or a weighing machine. The fact is that, Holland says, one should not take the notion of being non-accidentally right by itself, in isolation, but only in the context of some specific kind of things being non-accidentally right. From this he concludes that we should not accept the suggestion that Unger's formula specifies only the most minimal sense of knowledge. Holland suspects that a careful development of the formula, whether or not on the causal lines attempted here, could reveal it to be logically equivalent to some suitably modified version of the traditional 'justified true belief' theory. But Holland has not shown us how this is possible.

Holland's theory shows that Unger's non-accidentality
thesis cannot be maintained, for a complete explanation of this theory involves difficulties. He shows that in order to make a plausible theory of knowledge, we have to make a compromise with scepticism.

From the above analysis it seems that the non-accidentality thesis is not very promising. Unger's use of the phrase 'non-accidental' cannot be accepted.

SECTION-IV ARMSTRONG'S THEORY

ARMSTRONG'S OBJECTIONS TO THE SIMPLE FORM OF CAUSAL THEORY

Armstrong points out two main difficulties of the causal theory of knowing in its simple form. First of all, even in cases of particular matters of fact, the situation known is not always causally responsible for the existence of the belief. Granted that all our knowledge is in practice inferential, non-inferential knowledge of the future (for example, that I will be ill tomorrow) is still possible. We can provide an account for these cases by sophisticating the causal analysis. Armstrong says, ".....both the illness tomorrow and today's belief that I will be ill tomorrow have a common cause, for example, some condition of my body today not only leads to illness tomorrow but also gives rise to the
belief that I will be ill tomorrow.\textsuperscript{53}

The second objection is a more serious one. He presents a case where the situation that makes 'P' true gives rise to Bap (a's belief that p is the case) but he would not say that A knew that P. He illustrates this by the following:

"Suppose, for instance, that A is in a hypersensitive and deranged state, so that almost any considerable sensory stimulus causes him to believe that there is a sound of certain sort in his immediate environment. Now suppose that, on a particular occasion, the considerable sensory stimulus which produces that belief is, in fact, a sound of just that sort in his immediate environment. Here the p-situation produces Bap, but we could not want to say that it was a case of knowledge.\textsuperscript{54}

Armstrong thinks that these problems can be solved if we supplement the causal analysis with a reliability condition. But then the reliability condition itself is sufficient by itself for an analysis of non-inferential knowledge and the causal part becomes superfluous. This theory suggests that 'knowledge is empirically reliable belief.'
In spite of his emphasis on non-inferential knowledge which is based on the 'reliability' condition, inferential knowledge still covers a vast area in his discussion. So Armstrong's theory is divided into two parts: non-inferential knowledge and inferential knowledge.

**ARMSTRONG'S THEORY OF NON-INFERENTIAL KNOWLEDGE**

The classical definition of knowledge is that knowledge is true belief together with good reasons for that belief. "To say that I have good reasons for a proposition, P, is to say that I know other truths, q, which constitute good reasons for p. This new knowledge will itself require the possession of further good reasons, and so on ad infinitum". Thus the classical definition of knowledge is vitiated by infinite regress. To avoid this infinite regress he concludes that in the end we must get back to knowledge that is not inferential, that is to say, there must be non-inferential knowledge.

Armstrong's earlier versions of non-inferential knowledge are found in 'Max Deutscher and Perception' and 'A materialist theory of mind' and his subsequent version of this theory is found in 'Belief, Truth and Knowledge.'
In 'Max Deutscher and Perception', Armstrong's problem is, "what marks off knowledge without reasons from mere true belief without reasons?" According to him, the man who knows is the man who can be relied on to get it right. He says,

"A knows P without good reasons when:

In conditions of a certain sort, C,

(i) A believes P.
(ii) P is true.
(iii) A believes things of the sort P only if things of the sort P are true."^55

Condition (iii) can also be presented as a sort of causal connection. Armstrong says that in conditions, C, there is an empirical law-like connection between A's belief that P and the truth of P. In mere true belief, condition (iii) is not necessary. In this formula it is presupposed that we are dealing with true beliefs. Therefore, it does not give us any criterion for truth.

In 'A materialist theory of mind', Armstrong says that "knowledge is a belief which it is impossible we should be
wrong about".56 But that impossibility is not logical impossibility. Those who hold that knowledge is based on self-evident or logically indubitable truths make this mistake. Such knowledge, according to Armstrong, is incoherent. By 'impossibility of mistake', he means empirical impossibility of being wrong. An empirically reliable belief is such that it cannot be empirically false. He gives the following definition of non-inferential knowledge:

"A knows P non-inferentially if and only if: A has good reasons for P but:

(i) A believes P;

(ii) P is true;

(iii) A's belief that P is empirically sufficient for the truth of P."57

He thinks that given (i) and (iii), it is entailed that (P) is true. So condition (ii) is redundant. So he simplifies the above conditions in the following way:

"A knows P non-inferentially if, and only if, A has no good reasons for P but:

-: 296 :-
(i) A believes P;

(ii) A's belief-that-P is empirically sufficient for the truth of P.

Armstrong himself points out some possible objections against his analysis of non-inferential knowledge.

First, this theory only shows that in order to know P, my belief must be such that in that particular situation, it is empirically sufficient for its own truth. But then, in order to know that P is true, I have to discover the empirical connection between believing P and the truth of P. But by the proposed analysis, I cannot know that there was such a connection.

Second, this theory defines non-inferential knowledge in the strict sense. But there is also a broader sense in which A's belief that P was not empirically sufficient for the truth of P but give a very high probability of P's being true. But Armstrong's analysis does not consider these cases.

Third, this theory can explain an empirical relation between two particular states of affairs. But such relationship is not possible in the case of general laws and necessary
truths such as 'arsenic is poisonous' and '7 + 5 = 12. If we want to make a distinction between knowledge of general truths and logical necessities and mere true beliefs about such matters, we have to refer to our possession or lack of good reasons for these beliefs.

The above objections make it clear that Armstrong himself is not satisfied with the account of non-inferential knowledge presented by him in 'A materialist theory of Mind'. Furthermore, his earlier versions of non-inferential knowledge only states that there is a law-like connection between two particular states of affairs (A's belief that P and P's being true) but fails to explain the nature of this connection. But in order to distinguish between a reliable belief and a mere true belief, it is essential that the law-like connection should be explained clearly. In "Belief, Truth and knowledge", we find an improved version of his theory of non-inferential knowledge. Here he clearly states the scope of non-inferential knowledge and explains the nature of law-like connection itself. He uses the analogy of the thermometer in explicating his new version and so it can also be called the 'Thermometer account of non-inferential knowledge'. Here he tries to solve the problems involved in explaining particular matters of fact and general principles. For this, he enlarges the scope of
non-inferential knowledge. Moreover, he defends his analysis of non-inferential knowledge in terms of law-like connection by showing that this condition is both necessary and sufficient for his theory of non-inferential knowledge.

Armstrong contrasts his own account of knowledge, which he calls the 'moderate view', with two other views labelled by him respectively as 'pessimistic' and 'optimistic'. The moderate view states that our simpler judgements of perception are very often instances of non-inferential knowledge. In supporting this theory, he favours a psychological theory which seems to be right to him. According to this theory, there must be a law-like connection between the state of affairs Bap (A believes that P) and the state of affairs that makes 'P' true such that, given Bap, it must be the case that p. Here he uses the analogy of the temperature - readings given by a thermometer. Sometimes the thermometer - reading may fail to correspond to the temperature of the environment. Such a reading is like non-inferential false belief. In some other cases, the reading may coincide with the actual temperature. Such a reading can be compared to non-inferential true belief. This case can be sub - divided into two types of cases. First, the thermometer is a bad one but it corresponds to the actual temperature on a specific occasion. It can be compared with
non-inferential true belief which falls short of knowledge.
Second, the thermometer is a good one, and therefore a reading of
'T' on the thermometer guarantees that the environmental
temperature is T°. Such a reading can be compared with non-
inferential knowledge.

Armstrong requires the following conditions for non-
inferential knowledge if and only if:

(1) $P$

(ii) $(\exists H) \sum (Hv & \text{there is a law-like connection in}
\text{nature (x) if } Hx, \text{then } (\text{if } Bxp, \text{then } p))$

$Bxp$ and $P$ are here to be taken as states of affairs
rather than propositions. $H$ is used as a 'predicate variable'
in the predicate position.

He points out three features of 'law-like connections':

In the first place, these connections can in principle
be examined by scientific method, that is to say, by observation
and specially by experiment.

Secondly, the law-like generalizations which record the
existence of such connections give counterfactual or, more
generally, subjective conditionals. If p had not been the case, then it would not have been the case that A believes that P.

Thirdly, the connection between belief and state of affairs does not depend on the person who may record its existence. It is not a causal connection, but an ontological connection.

Armstrong, however, speaks of one defect of his formula. He says,

"P is a place-holder or dummy for a particular state of affairs. How then is it possible to bring P within the scope of a universal quantifier? How can we talk of states of affairs of the sort P?" 60

To remove this problem he tries to modify his formula previously given. He says that the proposition P asserts a particular matter of fact. All such propositions must involve (a) "reference to some individual" and (b) "predicating some property of that individual." He suggests that the structure of Ideas in the belief-state must actually have the form Jc. Thus the second condition asserts a general connection between (a) "beliefs that have the form Jc" and (b) "the actual
obtaining of what is believed".

Armstrong revises his formula in the following way:

"A's non-inferential belief that C is a J is a case of non-inferential knowledge if, and only if:

(i) $J^c$

(ii) $(\exists H) \left[ H^a \& \text{there is a law-like connection in nature} \right] (x) (y) \{ (\text{if } Hx, \text{ then } (\text{if } BxJy, \text{ then } Jy) ) \}$" 

He, however, points out that one characteristic of a good thermometer has no similarity with the account of non-inferential knowledge.

"Registration of temperature and actual temperature reflect each other. Given that a reliable thermometer is registering $'T^0'$, then the environmental temperature is $T^0$. But, equally, given that the environmental temperature is $T^0$, then the good thermometer will register $'T^0'$. But in the case of non-inferential knowledge, the second feature does not occur. If a person knows that C is J non-inferentially, then his belief is a reliable one. But it does not follow that if a
person is in condition H, and c is J, then that person believes that c is J. He may have no opinion at all about it. In this respect, the reliable thermometer is too strong a model for non-inferential knowledge.

Armstrong examines some important objections against his new version of the theory of non-inferential knowledge.

Max Deutscher points out that this formula puts no restriction on H. H can be any general property, non-relational and/or relational and the believer A has this property. Even in the 'veridical hallucination case', if H is specified in sufficient detail, then the law-like condition 'if Hx, then (if BxJy, then Jy)' will be satisfied. As the formula sets no limits on H, H can be specified in indefinite detail. But then the veridical hallucination case will become a case of knowledge. But this result cannot be accepted.

Armstrong thinks that this problem can be solved by placing some restriction upon H. He says that knowledge in a sense is a pragmatic concept and the man who has mere true belief differs from the man who has knowledge in that the former one is unreliable. He is right now, but he may be wrong in the future even in the same sort of situation. The following restriction is placed on H.
"H must not be so specified that the situation becomes unique, or for all practical purposes unique. H must be such that the situation has some real probability or at least possibility of being repeated. And, all other things being equal, the less specific H is, the greater the value of A's knowledge, because this increases the probability of repetition."

Armstrong shows that Deutscher's problem about non-inferential knowledge can also be applied to manifestations of ability or skill, and the proposed solution to this problem is also applicable there.

His theory is subjected to two or more criticisms. These two are, however, connected with one another. These criticisms are made by Christopher Murphy and Ken Waller. "In Murphy's case, if we consider simply the belief, there is no law-like connection between it and situations of the sort J." "In Waller's case, if we consider simply the particular contents of the belief, there is no law-like connection between beliefs with this sort of content and situation of the sort J." Armstrong, however, points out that "where two particulars are connected in a law-like way, they are connected qua particulars of a certain sort and not in virtue of other
characteristics they may happen to have. Murphy and Waller have simply constructed cases where the particulars involved are not connected \textit{qua} believers (Murphy) or \textit{qua} believers of a certain sort of propositions (Waller), although in fact the beliefs are true." He thinks that he can get rid of these objections simply by stating that nothing but nomically relevant characterizations appear in his formula.

In his modified formula, he adds a third clause.

"(iii) it is not the case that Bap is the cause of p."^{66}

He gives the following modified definition of non-inferential knowledge which places some restriction upon the second condition.

"A's non-inferential belief that c is J is a case of non-inferential knowledge if and only if :

(1) \( Jc \)

(ii) \((\exists H) \sum Ha \& \text{there is a law-like connection in }\)
He puts the following restrictions on (ii).

"(a) H must be such that there is a real possibility of the situation covered by the law-like connection recurring.

(b) The properties mentioned are nomically relevant to the law-like connection.

(c) The relation of BxJy to Jy is that of completely reliable sign to the thing signified. The knower himself will not have evidence for what he knows. That is the meaning of 'non-inferential'. But his own belief-state, together with the circumstances he is in, could function for somebody else (perhaps God) as completely reliable evidence, in particular as a completely reliable sign of the truth of the thing he believes." 68

He makes two points to defend the analysis of a law-like connection between beliefs and the thing believed. First, he argues that "a law-like connection between belief and the thing believed is at least a necessary condition for non-inferential knowledge." By the method of 'subtraction', he shows that empirical reliability of belief is necessary for
non-inferential knowledge. For "if there is considerable empirical chance for the belief being wrong", there would be no knowledge at all. Second, this condition is in fact necessary and sufficient, for we do not find any other necessary condition.

Armstrong's formula of non-inferential knowledge can explain only particular matters of fact. But beliefs expressed through universally quantified propositions which range over 'open' class (these are called 'general beliefs') will be outside the formula. So this account of non-inferential knowledge cannot be applied to non-inferential knowledge of law-like connection itself. But he points out that though knowledge of the specific content of general connections does not fit the formula, non-inferential knowledge that, on a particular occasion causal or other law-like connections hold between particulars, is quite possible. He examines whether beliefs with the content of an unrestricted existentially quantified proposition of the form (∃X) Fx does fit his formula of non-inferential knowledge. In Logic and Mathematics, there are some necessary propositions containing existential claims which are apparently of this form and these propositions can be treated as general beliefs. For if we examine these propositions, we will find that they are really unrestricted universally quantified ones. So the problem of general belief
is also involved here. But in the case of knowledge such as
'there exists at least one Zebra', the matter is different.
It is deduced from knowledge of propositions of the form 'a
is a Zebra' by existential generalization. Armstrong says:

"From the general nature of law-like connection in the
world we would expect that the belief will stand in some
particular natural relationship to at least one particular
Zebra. This Zebra's relationship to the belief state would
then be a factor such that, if it had been absent, the belief
state would not have existed. And so the law-like connection
involved will still be between the particular belief-state and
a particular Zebra or finite collection of particular Zebras.
It would thus be a connection whose existence could be
established, in principle at least, by the methods of natural
science."69

Thus it seems that Armstrong's formula gives an
account of the knowledge - conditions for all non-inferential
beliefs except general beliefs.

Armstrong concludes his analysis of non-inferential
knowledge by a final formulation of it.
"A's non-inferential belief that $c$ is $J$ is a case of non-inferential knowledge if, and only if:

\[(\exists H) \sum H \land \text{there is a law-like connection in nature (x) (y) } \exists Hx, \text{ then (if } BxJy, \text{ then } Jy) \sum Jy\]

(a) $H$ must be such that there is a real possibility of the situation covered by the law-like connection recurring.

(b) $X$ ranges over being capable of cognition.

(c) $Y$ ranges over particulars.

(d) $B$ is the belief operator.

(e) The properties mentioned are nomically relevant to the law-like connection.

(f) The relationship is restricted to that of reliable sign to thing signified.

\[(\text{It is not the case that } BxJy \text{ causes } Jy)\, .70\]

Nevertheless, though non-inferential knowledge is an important type of knowledge, there is also knowledge which is based on good reasons. This type of knowledge is called by Armstrong 'Inferential knowledge.'
ARMSTRONG'S THEORY OF INFERENCE KNOWLEDGE.

Armstrong presents the following account regarding inferential knowledge:

"A knows that P inferentially (on the basis of q) if and only if:

(i) A believes that P

(ii) A knows that q (non-inferentially)

(iii) A's belief that q actually functions in A's mind as a conclusive reason for believing P.

(iv) A knows the truth of the general principle of his reasoning." 71

He says that 'q' is a conclusive reason for believing that P if and only if it is the case that 'if q then p', and that is the case if q is an instantiation of Fx, and p an instantiation of Gx in the true general principle (x) (If Fx, then Gx). According to him, conclusive reasons are completely truth-preserving. He does not explicitly demand that P be true, but its truth is guaranteed, since q is known (and hence q is
true).

A's knowledge of the general principles of his reasoning may be either inferential or non-inferential, but even if inferential it must ultimately involve non-inferential knowledge of general principles. Armstrong shows that inferential and non-inferential knowledge do not differ as knowledge, whether it is particular matter of fact or general principles which are in question. The account of non-inferential knowledge of particular matters of fact can be extended to cover all knowledge of particular matters of fact, and the account of non-inferential knowledge of general principles can be extended to cover all knowledge of general principles. Inferential and non-inferential knowledge of both particular matters of fact and general principles are both qua knowledge, i.e., the same sort of thing.

Armstrong uses the model of thermometer in the case of inferential knowledge also but here he makes an addition. He imagines that the thermometer is operating in circumstances in which pressure varies directly with temperature. If the temperature is $T$, then the pressure is $P$. Furthermore, if the thermometer records '$T$', then it follows from it that an attached pressure-gauge records '$P$'. He further supposes that this whole apparatus, thermometer operating a pressure-gauge
is in a particular state and circumstance. This condition is such that if the thermometer is giving, not merely a correct, but a reliable reading, then the pressure-gauge is giving, not merely a correct, but a reliable reading. Now he assumes also that this condition of the apparatus nomically ensures the existence of the phenomenon of temperature in these circumstances. Such an apparatus, he thinks, serves as a model of general principles. This model seems to be best for non-inferential knowledge. But Armstrong imagines this state sustained by further conditions, in particular by further readings of other parameters of the environment, this sustaining having the same reliable character etc. found in the original connection of the thermometer-reading and pressure-gauge. Then it can work as a model for knowledge of general principles based upon further knowledge of general principles and/or knowledge of particular matters of fact.

Armstrong points out a defect of the thermometer model as a model for inferential knowledge. This is parrallel to the defect of this model as a model for non-inferential knowledge. If the temperature is T, then a reliable thermometer has to register 'T₀', but A's knowledge that p is not subject to the condition that, if P is the case, then, as a matter of law-like necessity, A believes that P. Knowledge is not a matter of two-way reflection. In this respect, it is not analogous to the thermometer model.
Armstrong examines a counter-example suggested by Gregory O' Hair to the analysis of inferential knowledge. In this counter-example, a father merely believes his son to be innocent of a crime he is accused of, but he has no evidence for it. Later he sees his son's innocence dramatically and unexpectedly proved in court. The problem is, to be a case of knowledge, a belief must guarantee its own truth. But it is clear from the original attitude that the father would have believed his son to be innocent even if the latter had in fact been guilty. Armstrong shows that this case does not falsify his account of knowledge. For after the court-hearing, the father gets some evidence of a sort which ensures knowledge of the thing evidenced in any rational person. And so his belief is now reliable in a way which previously it was not. He now instantiates some property H. He, therefore, knows. Moreover, Armstrong shows that if O Hair's case is attended by adding an extra condition to this case, still it does not falsify his account. It may be suggested that, even if his son was guilty, and was proved to be guilty in court to the satisfaction of any rational person, perhaps the father would still believe his son to be innocent. Armstrong thinks that in this altered case, the father never achieves knowledge. For there is no law-like connection between the belief and the fact.
Armstrong's 'reliability theory' is applicable to non-inferential knowledge only. But our knowledge is very often inferential. He, however, shows that all our knowledge must terminate in non-inferential knowledge. But an account of non-inferential knowledge cannot completely solve the problem of inferential knowledge. His theory of inferential knowledge can block the felicitous coincidence counter-cases, since he requires that 'our inferences must be completely truth-preserving'.

Peter Klein shows that the Grubit-case is not a counter-example to Armstrong's theory. In the original Grubit-case, S's evidence is that he sees a Tom-like person to stole the book and infers that it is Tom and concludes that Tom has stolen the book. But his evidence is not sufficient to guarantee that Tom stole the book. So the evidence is not conclusive, i.e., not completely truth-preserving. This requirement then saves Armstrong's thesis from Gettier-type counter-examples. But at the same time it excludes too much of our knowledge. The Grubit case requires that if a twin brother of Tom was not present in the library on that particular day, S would have known that Tom stole the book and he has adequate evidence for it. Klein points out that most of our empirical knowledge is not founded on "conclusive completely truth-preserving" reasoning. So Armstrong's argument is too strong. But if we weaken this requirement, we cannot avoid the Gettier-type counter-examples.
CASUAL THEORY IS NOT SUFFICIENT

The above analysis brings out the fact that it is a futile attempt to supplement the justified-true-belief analysis of non-basic knowledge with the causal theory. The set of conditions proposed by the causal theory are either too weak or too strong. If they are too weak, they cannot avoid the Gettier-type counter-examples. For felicitous coincidences can occur not only in the causal ancestry of beliefs but also in the inferences that terminate in the beliefs. If all inferences are absolutely truth-preserving, we can escape from felicitous coincidences. But then our argument will be too strong and many things will fall short of knowledge. It seems to be doubtful whether the causal ancestry of a person's beliefs is relevant to the question whether that person has knowledge. Even if it is relevant, an attempt to account for the various complex causal situations simply fails. In order to provide a satisfactory account of knowledge, we have to strengthen our evidence condition. Such an attempt is made by the defeasibility analysis of knowledge. Now we have to examine whether this account can save us from the Gettier-type counter-examples.
NOTES


10. The Grabit case was originally presented by Lehrer and Paxson in their article, "knowledge: Undefeated Justified True belief", published in Journal of philosophy, 66.8 (1969), pp. 225-237. This case will be explained in details in the next chapter.


12. Ibid., pp. 124 - 125.


15. Ibid. p. 133.


18. Ibid., p. 139.

19. Ibid., p. 142.


23. Ibid., p. 90.

24. Ibid., p. 91.

25. Ibid., p. 92.

26. Brian Skyrms. "The Explication of 'X knows that P'",


28. Ibid., p. 94.

29. Ibid., p. 97.


31. Ibid., p. 103.

32. Ibid., p. 103.


34. Ibid., p. 107.

35. Ibid., p. 108.

37. Ibid., pp. 110 - 111.

38. Ibid., p. 112.

39. Ibid., p. 114.

40. Ibid., p. 115.

41. Ibid., p. 116.


44. Ibid., p. 118.


54. Ibid, p. 158.


57. Ibid., p. 189.

58. Ibid, p. 189.


60. Ibid, p. 169.


63. Ibid, p. 175.

64. Ibid, p. 179.

65. Ibid, p. 179.

67. Ibid, p. 182.

68. Ibid, p. 182.

69. Ibid, pp. 196 - 197.

70. Ibid, p. 197.
