Abstract. An appropriately unprejudiced logical investigation of causation as a type of implication relation is undertaken. The implication delineated is bounded syntactically. The developing argument then leads to a very natural process analysis, which demonstrably captures the established syntactical features. Next relevantly-based semantics for the resulting logical theory are adduced, and requisite adequacy results delivered. At the end of the tour, further improvements are pointed out, and the attractive terrain beyond present developments is glimpsed.

The notion of cause, having fallen from favour in the heydays of logical positivism, has enjoyed a contemporary resurgence. But despite its fashionability now, especially as a major foundational element in epistemology, the logical and structural properties of causation remain quite insufficiently examined. In this situation, who knows whether the foundations will carry the philosophical castles being built (they are never complete, and invariably ramshackle)? Our preliminary investigation of causal implication suggests they will not; like structurally and materially short-supplied high-rise buildings, they will come tumbling down.

In treating cause as like a conditional (of implicational type) there is a familiar problem of getting in a satisfactory way from natural language locutions, e.g. of the form “\( \alpha \) causes \( \beta \)”, to conditional forms which typically couple sentences. A variety of expressions plug into the causal form, not just event subjects but gerundives such as “smoking” — but not significantly sentences. One difficulty in working with “\( \alpha \) causes \( \beta \)” as primitive is that not all the usual sentential connectives are particularly well-defined on the relevant substituents; e.g. negation becomes problematic with event clauses, though not as unintelligible as with proper names.

Still, it is not so difficult to make out what negation is doing applied to event clauses, to construe for instance \(~\) (mowing the lawn), as not moving the lawn. Let us allow in \( whatever \) can be made to fill out variable places, and let variables correspondingly range over such makable-out values. The constraints will then be imposed by the formation rules, not fixed in advance. Connectives which combine variables \( A, B, C, \ldots \) delimit what can be made out. For

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comparison with familiar logics, let these connectives be, to start with, just \&,
\lor, \neg, giving the zero-degree wff. Then we add the causal connective \( \exists \), read in
context "(the) obtaining of... causes (the) obtaining of...". It can be left open
for the present to what extent \( \exists \) combines with extensional connectives \&,
\lor, \neg; for instance, whether an entire higher degree results or only a first degree
part. This is a matter of what can be made out. Making out itself can eventually
be taken up through significance.

In this way we arrive, hopefully then, at a sufficiently well-behaved form
\( A \bowtie B \), to begin logical investigations, a form where \&,
\lor, \neg are well-defined
on combinations of \( A \) and \( B \), and also on uniterated forms \( A \bowtie B \). For example,
\( A \bowtie B \) may read \(" A causes \( B \)\)\), with \( A \) and \( B \) not being sentences, or \(" should
\( A \) happen it would cause \( B \) to happen\)\), or it may sometimes be read \(" A's
happening causes \( B \)'s happening\)\), or it may even be read \(" the truth of \( A \) causes
the truth of \( B \)\) (whatever that really means). The essential point is that we do
not shift out of the causal idiom at the outset (as e.g. Burks [1], Zinovev [11],
and others do), and so prejudice or prejudice several issues, such as whether
causal idiom is modal, whether we are working with something like partial
sufficiency or not, and so on.

In this way also we can wend through a minefield of research-paralysing
objections (such as those laid by Davidson [2], e.g. p. 161) as to what the
grammatical and logical forms of causal statements really are. In particular, we
do not say, or require, that the relation of causation is represented, through
a sentential connective. It is enough that \( \bowtie \) forms sentences on certain terms,
which are sometimes propositional or fact-like or rendered such by happening
or occurrence functions (so delivering a partial higher degree). Most convenien-
tly it is much the same with \textit{implies} as it is with \textit{cause}, and as it is with bridge
verbs such as \textit{means} and \textit{intends}. All these two-place connectors are senten-
cce-forming on many linguistic items other than propositional or fact-like
expressions. For instance "that flood caused a famine"; is paralleled by "that
flood meant a famine"; "the failure of the sprinkling system caused that fire"
is matched by similar sentences built around "meant" or "implied". What is this
implication-like causal connection like?

The method of the reflexive equilibrium approach we then adopt is this: we
try to reach, by working through a standard list of key logical principles for
implication, a core logic and some important rejections for the notion of cause.
We certainly leave open the option that various types of cause can be
characterized through satisfaction of extra principles, e.g. reverse causation,
proximate causation, logically extended causation, etc. In reaching a core we
are much helped if we separate out various notions that have been confused
with cause, such as conditionals. Having begun to move to a core causal logic,
and associated typology, we begin to cast about for some logical explanation of
the core, preferably of a semantical cast or semantically adaptable. In the
presentation we borrow symbolism and terminology from [6].