ABSTRACT. The author argues for the importance of non-Markovian causality in the social sciences because Markovian conditions often cannot be satisfied. Two theorems giving conditions for non-Markovian causes to be transitive are proved. Applications of non-Markovian causality in psychology and economics are outlined.

When we consider familiar observable properties of a physical object we postulate almost without thinking that these properties are determined by the particular atomic structure of the object at the moment of observation. If we know the current atomic structure we firmly believe that it is not necessary to know anything about the history of the object. It may well be that in many practical instances this assumption is a theoretical one that we cannot put into practice, but it is a deep and important theoretical assumption about the Markovian character of the physical world. It is a standard theoretical move in physics to postulate a concept of state such that if we know the state of a system at a given time we need know nothing about the system at any earlier time in order to analyze and predict its future behavior. This radical Markovian truncation of the past is one of the most essential general concepts in the physical sciences.

It is an important methodological and scientific question to what extent a similar viewpoint can be made to work in the social sciences. I have deliberately not said that it was a general philosophical issue. The reason for this omission is obvious. It is reasonable to believe that a person’s beliefs and actions at a given time are determined by the current encoding of his past experience in his central nervous system and by the current state of the many chemical substances in his body at the present instant, together with the current circumstances of his environment. Almost none of us accept a philosophical view of action at a distance across time so that an event that occurred in the past directly affects an action taking place now. In the present instance, however, our philosophical views although perhaps correct in general principle are too complacent and do not readily form a basis in many areas for serious scientific endeavor. The difficulty is easy to describe. We are not able to give a theory or description of the current state of a
person, or more generally of a society, with sufficient accuracy and
detail to be of much direct use in scientific analysis of any personal or
social phenomenon of interest.

The scientific problem is that of being able to postulate detailed
internal states that have essential properties of uniformity across many
different situations. The great success of the physical sciences has
depended upon the structural identity of substances, at least in relation
to the phenomenological properties we have as yet investigated with
any thoroughness. In essential ways, all atoms of a given kind, for
example, hydrogen, mercury, etc., are identical in structure, or there
are in almost all circumstances a very small number of variants. In
contrast, it seems a plausible negative thesis that in the case of persons
nothing like such uniformity of structure holds for the properties we
consider essential, for example, the internal psychological structure of a
person's memory, feelings, etc. There is much to support such a
negative thesis at the present time and, therefore, reasons to be
skeptical that a powerful and scientifically useful concept of state can be
introduced in ways that render the postulated processes of a person or a
social group Markovian in character.

Whatever the status of the general conceptual argument I have been
trying to give, the empirical evidence on the kinds of models that are
actually used in the social sciences very much supports my thesis. What
I want to do in the remainder of this article is to explore various aspects
of this non-Markovian kind of analysis, and to speculate on its con-
sequences for theory construction.

To begin with, I show that transitivity of probabilistic causality does
not depend upon a Markov condition although, as has been shown by
Eells and Sober (1983), such a Markov condition is sufficient even
though too restrictive. It is easy to want to hold that any reasonable
theory of causality should be transitive in character, that is, if \( A \) is a
cause of \( B \) and \( B \) is a cause of \( C \), then \( A \) should be a cause of \( C \). As we
shall see, this is a characteristic feature of a wide class of non-Markov-
ian processes. It would be disturbing for the theory of non-Markovian
causality if this were not so. In the second section, I in fact turn to
examples of such processes, drawn from psychology, in particular from
learning theory. The third section considers examples of such processes
familiar from econometrics.

To avoid any misunderstanding in the examples that follow, I note
that by *Markov condition* I mean first-order Markov condition. We can,