Toward a Theory of Recurrence

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In "Events and Propositions"[1] Professor Chisholm offers a sketch of a theory of recurrence, based on one of four proposed definitions of "event p recurs." They are

(1) There are three different times such that p occurs at the earliest, the latest, and not at the one in the middle.

(2) There are three different occasions such that p occurs at the earliest, the latest, and not at the one in the middle.

(3) There are events q, r, and s, such that r occurs after q, s occurs after r, and p is exemplified or instantiated in q and s but not in r.

(4) p occurs, and then after that not-p occurs, and then after that p occurs.

The first three are rejected because they make questionable metaphysical assumptions too early in the game. (1) posits entities called "times," and (2) posits entities called "occasions." (3) posits two kinds of events—namely, "concrete" (e.g., r and s) and "abstract" (e.g., p), as well as the relation "exemplification" or "instantiation."

Chisholm's alternative, however, seems no less metaphysically complex. First he introduces the "concept" of the negation of an event, which, considering the use to which it is put in his definition and in the rest of his system, succeeds in adding *negative events* (e.g., not-p) to his ontology. These events are supposed to capture the distinction between, say, "John's not-ϕing occurs" and "John's ϕing does not occur (where the verb is tenseless). Moreover Chis-

[1] *Noûs*, IV 1, (Feb. 1970): 15–24.

holm later introduces another kind of event into his scheme—namely, *conjunctive events.*

The first three definitions are not abandoned, then, by a straightforward application of Occam's Razor. Chisholm clearly is weeding out just those metaphysical assumptions which he finds undesirable. Moreover, he presumably thinks that a theory fashioned after (4) could simplify our talk about events in a way in which the others could not. In particular, (4) would enable us to reduce talk of particular occurrences of events to talk only about events.

Although negative and conjunctive events may suit our ontological intuitions better than times, occasions, or concrete and abstract events, an account of recurrence that appealed only to events *simpliciter,* and which, like (4), reduced talk of particular occurrences of events to talk of events, would at least have a *prima facie* advantage over the others. In what follows I suggest such a theory.

Consider another definition of "event p recurs," employing tensed verbs.

(5) It is, was, or will be the case that p is not occurring but did occur and will occur.

Professor Chisholm proposed this definition in conversation but said that he was unable to see how it could lead to an adequate theory of recurrence. I think it can be shown, however, that the tensed technique of (5) is fertile enough to generate a calculus of recurrence at least as adequate (on Chisholm's criterion of metaphysical simplicity) as the system fashioned after (4). Moreover the tensed version still permits the reduction to talk only of events.

The system presented below is compatible with most of Chisholm's explicit metaphysical assumptions (p. 17), and in particular, with his thing-ontology. However two of his ontological posits will be bypassed. The first and least objectionable is the assumption that there are conjunctive events, e.g., (p & q), taken, presumably, to be the simultaneous or overlapping occurrences of at least two events. Chisholm needs this assumption to be able to pick out events occurring at the same time, without referring to any such things as "times." In the tense logic which follows, however, we will not need a special class of events to indicate that two events occur at the same time (cf. D4 below). We will also not adopt the assumption that there are negative events, thus avoiding what is perhaps Chisholm's most peculiar entity.

My general strategy is to follow Chisholm in defining those

expressions which he takes to be essential to a theory of recurrence. Chisholm defined "p recurs," "p always occurs," and "p occurs exactly once." These three expressions as well as his primitive expression, "p occurs before q begins," were then used to define expressions about particular occurrences of events, thereby reducing such talk to talk just about events. For each of Chisholm's four basic expressions I offer a tensed counterpart. Moreover, in order to insure an ontological reduction, I define expressions about negative and conjunctive events using only expressions about "ordinary" events. These defined expressions appear in the definientia of Chisholm's system. A few needed axioms are introduced as well, which do not correspond to those used by Chisholm.

The underlying syntax is that of Lemmon's minimal tense logic K_t.[2] We will take as undefined, the operators 'F' for 'it will be the case that . . .' and 'P' for 'it was the case that . . .'. These supplement the usual two-valued truth-functions 'Cpq', 'Np', 'Apq', 'Kpq', and 'Epq'. In addition we will define two more forms—namely, 'Gp' (it will always be the case that p) = df 'NFNp', and 'Hp' (it has always been the case that p) = df 'NPNp'.

Two rules and four axioms usually round out the system. Although we will not be using them, they are,

$$\text{RG: } \vdash \alpha \rightarrow \vdash G\alpha \qquad \text{RH: } \vdash \alpha \rightarrow \vdash H\alpha$$

(i) CGCpqCFpFq (ii) CHCpqCPpPq

(iii) CPGpp (or CpGPp) (iv) CFHpp (or CpHFp).

In this system 'p', 'q', etc., play the role of genuine variables, ranging over events. When such a variable appears in a formula, we are to imagine the (suppressed) predicate "occurs" to the left of it. We could write 'O' for "occurs" and plug it into our formulae; but it should not be necessary. This at least allows us to retain a visual resemblance to standard Prior-type expressions.

Moreover this convention diverges in yet another way from standard tense logic practice (such as it is). Normally 'p', 'q', etc., are schematic letters, replaceable by present-tense sentences. Since the singular terms in these sentences (e.g., "John" in "John ϕs") presumably denote *things* rather than *events*, it is easy to see why Prior supposes that tense-logical expressions commit one to a thing-

[2] This and other tense-logical postulate sets may be found in A. N. Prior, *Past, Present, and Future* (Oxford: Clarendon Press, 1967): 175–182.

ontology.[3] However, when our variables range over events (e.g., John's ϕing), we are not obviously committed to the existence of anything but events.

Before presenting the corpus of the system, one more remark on notation seems advisable. All but two of the definitions which follow have, as a definiens, a disjunction consisting of a present-tense sentence, and that same sentence occurring within the scope of the tense indicators 'P' and 'F' in turn. This should enable us to render intelligible tenseless occurrences of verbs in the definienda, and obviously captures the force of the rather long tense operator, "It is, was, or will be the case that. . . ." In fact, let 'T' abbreviate this operator; and let us define 'Tp' as 'AApPpFp'.

Actually, the expression "It is, was, or will be the case that . . ." does not express the import of tenseless verbs. A strict tensed counterpart to "p occurs" (tenseless) would rather be 'KKpGpHp', where the variable 'p' ranges over tenseless sentences, containing, probably, dates or time-indexicals. However such an approach would lack those features which make the system offered here interesting. It would be at best a cumbersome paraphrase of a tenseless theory of recurrence.

To the original axioms of K_t, then, let us add

(v) CNPpPNp,

and its mirror image, substituting 'F' for 'P'. The converse of (v), however, does *not* hold. We thus build in to this system a distinction secured by Chisholm in his system with negative events. This is the distinction, roughly, between an event's never occurring, and its failure to occur at a particular time. For Chisholm, these would be rendered, respectively, as "p does not occur [tenseless]" and "not-p occurs." We also remove the ambiguity between these two expressions of the unformalized "p did not occur." Since 'NPp' = 'NPNNp' = 'HNp', we can paraphrase (v) as follows. If it has always been the case that p does not occur (i.e., if p never occurred), then it was the case that p does not occur (i.e., then p did not occur).

Let us now add two more axioms and their images.

(vi) CPPpPp (If it was the case that it was the case that p occurred, then it was the case that p occurred)

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[3] A. N. Prior. "Changes in Events and Changes in Things," in *Papers on Time and Tense* (Oxford: Clarendon Press, 1968): 1–15.

(vii) CKPpPqAAPKpqPKpPqPKqPp (If both p and q occurred, then either they occurred together, or one occurred before the other).

Consideration of (vii) should make it clear that we do not want as axioms, 'EPKpqKPpPq' and its image, although we might want to add the unobjectionable conditional 'CPKpqKPpPq' and its image. Also it should be obvious that the following two expressions (and their images) are not contradictory—namely, 'Pp' and 'PNp'. However 'Pp' and 'NPp' (and their images) *are* contradictory.

We may now define "event p recurs" as follows.

(D1) 'p recurs' =df 'TKpPKNpPp', i.e., T(p is occurring; and it was the case both that p does not occur and p did occur).

A simpler and perhaps more readily obvious definition of "p recurs" would have been 'TKKNpPpFp', which corresponds to the original tensed definition (5) noted above. However (D1) has an attractive feature which (5) does not have, and which I have tried to preserve in every definition (with the exception of (D7')) whose definiens begins with the operator 'T'. This feature is simply that the definiens can be broken down into sentences which express what we mean in English by the definiendum in the past, present, and future tenses. For example "p recurs" in English present-tense entails "p is now occurring [for at least the second time]". This is what the present-tense disjunct of the definiens of (D1)—i.e., 'KpPKNpPp'—says: by simplification we can infer 'p'. Similarly, prefixing the present-tense disjunct by 'P' or 'F' yields an expression corresponding, respectively, to "p did recur" and "p will recur." This result is not obtained, however, by defining "p recurs" as 'TKKNpPpFp'—i.e., the original (5). The present-tense disjunct of the definiens—i.e., 'KKNpPpFp'—does *not* entail that p now occurs. In fact, the two occurrences of p are stated in the past and future tenses.

To fill in the system, we now need the following additional definitions.

(D2) 'p always occurs' =df 'KKpGpHp', i.e., p is occurring; and it always will and always has.

(D3) 'p occurs exactly once' =df 'TKKpNKpPKNpPpNFKpPKNpPp', i.e., T(p is occurring; but it is not recurring and will not recur).

(D4) '(p & q) occurs' =df 'TKpq', i.e., T(p occurs and q occurs).

(D5) '(p & not-q) occurs' =df 'TKpNq'

(D6) '(p & not-q) does not occur' =df 'TNKpNq' or 'TCpq'.

Chisholm introduces the earlier-later relation into his system with his primitive locution 'pBq' for "p occurs before q begins." Since 'pBp' is Chisholm's definiens for "p recurs," and since a tensed definition of "p recurs" has already been provided, we need only to define 'pBq' where $p \neq q$. It might at first seem obvious that 'pBq' should be rendered simply as 'TKpFq'. Prior (*Papers on Time and Tense,* p. 64) in fact claims that this definition is the correct one. But we can see that the definiens might be satisfied while the definiendum is not, as in the case where q is an eternal event, or any event beginning before p and continuing through p's duration. While p is occurring, 'TKpFq' would be true, although p did not occur before q.

A further minor problem here is to decide whether we want p to have *ended* before q begins, or whether p and q can overlap. At this stage in the game, however, it does not seem to matter which alternative we prefer. Moreover, Chisholm's account seems amenable to either approach. Thus, we have a choice between the following two definitions. The first definition is compatible with p and q being overlapping events.

(D7) 'p occurs before q begins' (for $p \neq q$) =df 'TKpFKNqFq', i.e., T(p occurs; and it will be the case that q does not occur but it will).

The stronger version of (D7), however, requires p to end before q begins.

(D7′) 'p occurs before q begins' (for $p \neq q$) =df 'TKKKNpNqPpFq', i.e., T(neither p nor q are occurring; but p did occur and q will occur).

The definiens of (D7′) does not consist of three disjuncts, each corresponding to one of the past, present, or future modes of the definiendum in English. The reason for this is simply that the definiendum cannot be expressed in all three modes. If "p occurs" is true in the present-tense, "q begins" cannot be, since, although both expressions are supposed to be in the same tense, p must end

before "q begins" can be true. Accordingly, if "q begins" is true in the present, "p occurs" must be true in the past. That this does not seem to match English usage of "p occurs before q begins" provides one reason for preferring (D7) to (D7′).

Observe that my program has no problem of misconstruing (a) "John's not-ϕing occurs" (a negative event) with (b) "it is not the case that John's ϕing occurs." For Chisholm (b) would be true if and only if John never ϕs, since "occurs" is tenseless; and (a) would then be true if and only if either (b) is true or John had ϕd before but is not ϕing now. Thus, the distinction is between "it is not the case that p" and "it is never the case that p." The former comes out in this system simply as 'Np'; and the latter can easily be defined as follows.

(D8) 'p never occurs' =df 'KKNpNPpNFp' or 'NTp'.

We have now defined all of the expressions occurring in the definientia of Chisholm's D4, D5, and D6. Thus we have devised a tense-logical version of his reduction of talk about particular occurrences of events to talk just about events, but without the extra metaphysical appendages of conjunctive and negative events.

The only events denoted in this system are, as it were, positive events, which either occur or fail to occur. In fact, not only do we not need negative events to preserve the distinction between an event's never occurring and its failure to occur at some time, but the kinds of formulae that would appear to denote negative events in this system turn out to be ill-formed. Letting 'O' assume its rightful place as the unary predicate "occurs", we cannot have such expressions as 'ONp' or 'PONp', since 'N' operates on sentences, and 'p' in 'ONp' is only the name of some event. Similarly, expressions about conjunctive events, such as 'OKpq', also turn out to be ill-formed. Since 'K' is a sentential connective, and since 'p' and 'q' are merely placeholders for names of events, 'Kpq' is not only itself ill-formed (since 'O' is no longer suppressed), but it is also not the name of an event. Moreover the result of putting the 'O's back in 'Kpq' is *a fortiori* not the name of an event. And since 'O' only appears to the left of event-variables in this system, 'OKpq' is ill-formed.[4]

[4] I am indebted to Professor Chisholm and to Edmund Gettier for many helpful suggestions on early drafts on this paper.

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Noûs, Vol. 5, No. 2. (May, 1971), pp. 191-197.

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Noûs is currently published by Blackwell Publishing.