

**The starting point of the research on tenses:
Prior and Hamblin
Some missing documents.**

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In a letter to Prior dated 10/19/1961, Hamblin voices his opinion about the status of early tense logic: "I feel a little guilty about having left it all so unfinished, but I am glad to see it used". Actually, if Prior is the pioneer of modern tense logic, Hamblin ought to be considered one of the most active participants in the effort to give a foundation to the discipline.

The aim of my talk will be to give an account of the achievements in tense logic reached by the fruitful collaboration between A. N. Prior and C. L. Hamblin. Prior and Hamblin had roughly the same geographic origin (New Zealand and Australia) and, more to the point, they had common aims the bases for tense logics. Prior's and Hamblin's main common interest was to discover the implication relations between the present tense, i.e. the sentence p (that is not temporally neuter, but substantially is a present tense sentence) and the other irreducible tense operators, in particular, any couple of irreducible tense operators which are prefixable to a sentence.

Further, the collaboration between Prior and Hamblin has had the following objectives: to propose a minimal tense logical system, giving an in-depth analysis of some formulas, and, above all, to search for an axiomatic base to which it is possible to add other axioms, in order to make clear some specific conception of time.

Finally, I would like to explore their conception of the real nature of time and its minimal components.

We can gather some information about the collaboration between the two logicians in Prior's book which marks the official beginning of modern tense logic in the scientific literature [5], as well as in several papers, and in the letters written by Hamblin to Prior from 11/30/1956 to 05/31/1966. Moreover, less than a month before Prior's death, the two logicians took part in the conference organized in Oberwolfach, West Germany, by the International Society for the Study of Time. Hamblin mentioned in the *Proceedings*, dated 1972, the fruitful exchange with Prior both during the conference and also by letters.

Let us start from [1], where Hamblin discloses that his "first offering is a set of axioms for a simple 'dateless' tense logic, i.e. with F and P as monadic operators". The axioms, translated from Polish to Standard notation are:

1. $F(p \vee q) \leftrightarrow Fp \vee Fq$
2. $\neg F \neg p \rightarrow Fp$
3. $FFp \leftrightarrow Fp$
4. $FPp \leftrightarrow p \vee Fp \vee Pp$
5. $\neg F \neg Pp \leftrightarrow p \vee Pp$

The rules are: i. $\alpha \Rightarrow \neg F \neg \alpha$; ii. $a \leftrightarrow b \Leftrightarrow Fa \leftrightarrow Fb$; iii. a "mirror image" rule, in order to infer from any law a corresponding one with P for F and *vice versa*. The resulting account of time, therefore, is a basic "two-way infinite continuous time-scale".

Another achievement of [1] was the diagram which describes the implication relations in that

system. In [3] the diagram is augmented with further relations and by introducing the strong tense operators G ("It will always be the case that -") for the future and H ("It has always been the case that -") for the past as primitives, as suggested by Prior. Hamblin explicitly endorses Prior's choice in [2] ("I like your formulation using all four tense-operators"). The diagram representing the implication relations in [3] will be explained by Prior in [5, p. 46]. It might be intriguing to compare Hamblin's minimal tense logical system with Prior's analysis in [4], and the system that is *par excellence* the minimal one, i.e. K_t . The five axioms in the minimal K_t are:

1. α , where α is a tautology of the propositional calculus
2. $G(p \rightarrow q) \rightarrow (Gp \rightarrow Gq)$
3. $H(p \rightarrow q) \rightarrow (Hp \rightarrow Hq)$
4. $p \rightarrow HFP$
5. $p \rightarrow GPP$

The rules are: *RMP*. If $\vdash p$, and $\vdash p \rightarrow q$, then $\vdash q$; *RG*. If $\vdash p$, then $\vdash Gp$; *RH*. If $\vdash p$, then $\vdash Hp$. Following Prior, the justification of the quest for a minimal system is the fact that any particular property – e.g. denseness ($Fp \rightarrow FFP$ about the future, and its "mirror image" $Pp \rightarrow Ppp$ about the past) or linearity ($p \wedge Gp \wedge Hp \rightarrow HGP$) – already involves a particular physical preconception.

Another issue is: what are the minimal constituents of time? It is not irrelevant to mention that the last time Prior and Hamblin met each other was on the occasion the First Conference of the International Society for the Study of Time (31st August – 6th September, 1969). Both of them gave a talk about what they thought as the *στοιχεῖον* of time: according to Prior, the notion of present, according to Hamblin, the notion of interval gained by a comparison between instants and intervals.

Prior highlighted the tight relation between the concepts of what is real, present, true. A correct idea of his view can be gleaned by an exploration of its presentism, i.e. there exist only present and actual events. This theory, supported by Prior, may be found as influencing several of his linguistic and ontological papers, e.g. [6] or [7]. But Prior's belief is that "the real world or the actual world is just a region of some larger universe which contains other regions as well – possible worlds, imaginary worlds, and so on". In the first cited paper, Prior points out a "genuine difficulty", but he does not renounce the problematic claim that "the present is an instant".

Hamblin's talk made an effort to search a different (but philosophically no less problematic) solution. Hamblin in [8] suggested that "instants can have no content" and especially that "if time divides into instants we can give no account of temporal relations". Given these philosophical objections, the very project of tense logic would fail. However, since Hamblin was convinced that it makes sense to build a tense logic, he decided to refer to intervals of time rather than to instants, giving an exact formal system.

Recovering Prior's missing letters to Hamblin would be insightful. These are precious evidences which have not been studied yet, but whose importance can be guessed from several declarations, proofs, hypotheses and suppositions that we can read in Hamblin's letters. Prior's missing letters would also be useful in order to clarify some questions about the formal account of tense logic and in particular about the achievements of the correspondence with Hamblin.

References

- [1] C.L. Hamblin, letter to Prior dated 04/18/1958 (VL n. 7). *The Prior Collection*, Bodleian Library, Oxford.
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- [4] A.N. Prior, "Postulates for Tense-Logic", *American Philosophical Quarterly*, v. 3, n. 2, 1966, pp. 153-161.
- [5] A.N. Prior, *Past, Present and Future*, Clarendon Press, Oxford, 1967.
- [6] A.N. Prior, "Fugitive Truth", *Analysis*, v. 29, n. 1, 1968, pp. 5-8.
- [7] A.N. Prior, "The Notion of the Present", *The Study of Time. Proceedings of the First Conference of the International Society for the Study of Time*, Springer-Verlag, Berlin, 1972, pp. 320-323.
- [8] C.L. Hamblin, "Instants and Intervals", *The Study of Time. Proceedings of the First Conference of the International Society for the Study of Time*, Springer-Verlag, Berlin, 1972, pp. 324-331.