Bulletin of the **S**ection of **L**ogic
Volume 19/1 (1990), pp. 30–32

reedition 2005 [original edition, pp. 30–32]

Konrad Turzyński

THE TEMPORAL FUNCTORS IN THE DIRECTIONAL LOGIC OF ROGOWSKI – SOME RESULTS

This is an abstract of the paper presented on XXXV Conference on the History of Logic, Cracov, November, 15–17 1989.

The directional logic of Rogowski (see [3] and [4]) is a four-valued propositional calculus. Its values are truth (v: "it is the case that..."), sub-truth (i: "it begins to the case that..."), sub-falsehood (u: "it ceases to be the case that...") and falsehood (f: "it is not the case that..."). There is one designated value in the matrix, namely truth. The functors of this calculus: seven unary ones – weak negation N, strong negation $\bar{N}$, initiation $\overrightarrow{N}$, "finalization" $\overleftarrow{N}$, strong assertion T, retention $\overleftarrow{H}$ and proretention $\overrightarrow{H}$ as well as three binary functors – implication C, simple disjunction A, simple conjunction K are defined by the following truth-tables.

p	Np	$\bar{N}p$	$\overrightarrow{N}$	$\overleftarrow{N}$	Tp	$\overleftarrow{H}$	$\overrightarrow{H}$
v	f	f	u	i	v	v	v
i	u	v	v	f	f	f	v
u	i	v	f	v	f	v	f
f	v	v	i	u	f	f	f

C	v	i	u	f
v	v	i	u	f
i	v	i	u	u
u	v	i	i	i
f	v	v	v	v

A	v	i	u	f
v	v	v	v	v
i	v	i	i	i
u	v	i	u	u
f	v	i	u	f

K	v	i	u	f
v	v	i	u	f
i	i	i	u	f
u	u	u	u	f
f	f	f	f	f

It is suitable to remind of the fact that $\overleftarrow{H}$ means "it is still the case that p" while $\overrightarrow{H}$ means "it is already the case that p" and therefore these

two functors may be used to reconstruct some temporal relations in the logic of Rogowski. The present proposal of this reconstruction is following:

'Pp' = '$A\overleftarrow{N}p\overrightarrow{H}Np$'	weak past tense
'Fp' = '$A\overrightarrow{N}p\overleftarrow{H}Np$'	weak future tense
'Hp' = '$NPNp$'	strong past tense
'Gp' = '$NFNp$'	strong future tense

This interpretation of the temporal functors leads to the truth-table given below (which is an equivalent manner to interpretate):

Hp	Pp	p	Fp	Gp
f	i	v	u	f
f	f	i	v	v
v	v	u	f	f
u	v	f	v	i

This enables us to verify the fact that the fomulas given below are tautologies of the matrix built by Rogowski:

$$CPNF\bar{N}pp$$

$$CFNP\bar{N}pp$$

$$CHCpqCHpHq$$

and

$$CGCpqGpGq.$$

One may notice the "almost-equiformity" between these four formulas and the axioms of the minimal tense logic defined by Lemmon (see [2]). The slight modification (i.e. using strong negation instead of the weak one) is necessary, however the logical value of the first two formulae is truth when p is true or false and it is sub-truth (that is minimal distant from truth) when p is neither true nor false. Besides, it is worth to notice that under the same interpretation of P, F, H and G given by the last table above the two following "identities" hold, namely $KPNpFp = \overrightarrow{N}p$ and $T\overrightarrow{N}p = KHNpGp$ (what is intuitively obvious) where the sign "=" means equality of logical values. Unfortunately, other axioms – which appear in

more rich temporal logics – are not, in general, tautologies of the directional logic under the given interpretation of the temporal functors. For example, in the axiomatics of Hamblin (see [1] and [2]) neither the formula $CFpFFp$ (which determines density of time) nor the formula $CKpGpPGp$ (which determines discreteness of time) becomes a tautology in this interpretation. It is an unexpected observation. Another axiom of Hamblin is an exception, it becomes a tautology $CGpFp$ in the Rogowski's calculus. It is still the case (retention) that the author doesn't know any better interpretation of the temporal functors which might serve to reconstruct not only the minimal axiomatic of Lemmon (but also some other ones) in the Rogowski's logic.

References

[1] A. N. Prior, *Tense logic and the continuity of time*, **Studia Logica**, vol. 13, pp. 133-149.

[2] A. N. Prior, *Stratified metric tense logic*, **Theoria**, vol. 33 no. 1, pp. 28–38.

[3] L. S. Rogowski, *The logical sense of Hegel's concept of change and movement* (in polish) **Studia Filozoficzne** no. 6 (27), pp. 3–39.

[4] L. S. Rogowski, *Directional logic and Hegel's thesis on the contradict of change*, **Prace Wydziału Filologiczno-Filozoficznego TNT**, vol. 15 no. 2, pp. 5–32.

Departament of Logic
Toruń University
Toruń, Poland