INUS CONDITIONS

Johan VAN DER AUWERA

> A satisfactory logical theory of conditions is still very much of a *desideratum*.
>
> (von Wright, 1970; 161)

0. The term «inus condition» acronymically refers to an *i*nsufficient but *n*ecessary condition for an *u*nnecessary but *s*ufficient condition. It was introduced by J. L. Mackie (1965), who thereby explicates an idea which may ultimately go back to J. S. Mill and is reflected in Marc-Wogau (1962) and Scriven (1964). In accordance with Mackie's intentions inus conditionality has played a role in discussions on causality (see e.g. Vanquickenborne, 1969; Suppes, 1970; 75-77; Kim, 1971; von Wright, 1971: 187; Apostel, 1974; Sosa, 1975: 1-5; Platts, 1977: 202-206). In this paper I will claim that (i) the notion of an inus condition *as defined by Mackie* is vacuous, for absolutely every relation is one of inus conditionality (§ 2); (ii) an inus condition *as it was probably intended by Mackie,* is best described as an intensionally sufficient condition for an extensionally necessary one (§ 3). I will start out with a brief sketch of what it means for a condition to be extensional or intensional (§ 1).

1. As the quote from von Wright that tops the article indicates, our understanding of conditional relations was relatively poor in 1970. I do not think that the decade that has elapsed since then has brought any significant change. This is a little surprising, for the concepts of necessary and sufficient conditionality seem to belong to the very core of the philosopher's conceptual machinery. The necessary and sufficient conditions for the appropriate use of philosophical concepts are perhaps his basic concern (cp. Bennet, 1976: 22; Searle, 1979: 90). Yet, no matter how much one *uses* conditionality, one seldom *investigates* it. This paper evidences that I belong to the small group of investigators. (1)

A terminological point of importance is my following the custom of abbreviating the phrases «sufficient but unnecessary» and «necessary but insufficient» with, respectively, «sufficient» and «necessary». The only exception to this will be the expression «necessary and sufficient».

The small contribution to the theory of conditionality that I want to make here concerns extensionality and intensionality. Let me applv these notions to sufficient conditions first.

Suppose we want to know the sufficient conditions for the presence of a cat and a mouse. [2] I believe that the total set of such sufficient conditions can be split up into three groups: the intensionally sufficient conditions («s^i»), the extensionally sufficient ones («s^e»), and the ones that are partly intensional and partly extensional («s^{ie}»). (1) illustrates the intensional sufficiency.

(1) s^i_1 (cat, mouse) = white cat, mouse
s^i_2 (cat, mouse) = cat, white mouse
s^i_3 (cat, mouse) = big cat, small mouse

The s^i function instantiates (particularizes) one or more of the entities of the state of affairs it operates on. Different from this qualitative affair, the effect of a s^e function is rather quantitative. When a state of affairs is s^e for another one, the former merely extends (expands) the latter with one or more additional entities. For the presence of a cat and a mouse, for instance, it is s^e that there is a cat, a mouse, and a dog.

(2) s^e_1 (cat, mouse) = cat, mouse dog

Clearly, intensional and extensional sufficiency by no means exclude each other.

(3) s^{ie}_1 (cat, mouse) = white cat, mouse, dog

I admit that this analysis is relatively superficial. For one thing, I merely *assume* that the notation is intelligible. The orientation of this paper does not warrant too much energy on technicalities however. For another thing, I do not explain just what the difference is between instantiation and extension, or quality and quantity. Such difficult issues remain beyond the scope of this short note. Yet it seems to me that the examples sufficiently indicate what is meant by «intensional» and «extensional».

The step from sufficiency to necessity is a small one, at least if one accepts, as I do, their interdefinability. This quite traditional interdefinability claim is that x is a necessary condition for y iff y is a sufficient condition for x. No wonder then that the realm of necessary conditions can be subcategorized in three groups in the same way as sufficient conditions can. Some examples will suffice.

(4) n_1^i (cat, mouse) = cat, rodent
(5) n_1^e (cat, mouse) = cat
(6) n_1^{ie} (cat, mouse) = rodent

2. Given the terminological decision to let «sufficient» and «necessary» generally – except for the phrase «necessary and sufficient» – mean «*only* sufficient» and «*only* necessary», I can drop the «i» and the «u» from «inus». To symbolize that I am concerned about a necessary condition for a sufficient one rather than about a sufficient condition for a necessary one or about a condition that is both necessary and sufficient, I could turn the «s» into a subscript. So «inus» comes out as «n_S». With respect to the typology of extensionality and intensionality there are no less than nine types of n_S conditions. They are enumerated below.

(7) $n^i{}_{S^i}$, $n^i{}_{S^e}$, $n^i{}_{S^{ie}}$;
$n^e{}_{S^i}$, $n^e{}_{S^e}$, $n^e{}_{S^{ie}}$;
$n^{ie}{}_{S^i}$, $n^{ie}{}_{S^e}$, $n^{ie}{}_{S^{ie}}$

I will now take one of them, viz. the $n^e{}_{S^e}$ condition, and show that absolutely every relation between an arbitrary x and an arbitrary y is one of $n^e{}_{S^e}$ conditionality. The conclusion will be that the concept of $n^e{}_{S^e}$ conditionality and, a fortiori, that of ns conditionality have very little discriminative value and are relatively useless.

The first step in arguing that any relation between x and y is one of $n^e{}_{S^e}$ conditionality consists in showing that whenever x is either n *and* s (hereafter «*ns*»), s^i, s^e, s^{ie}, n^i, n^e or n^{ie} for y, x is also $n^e{}_{S^e}$ for y. Some examples will make my point. Suppose that the s^e condition for our cat and mouse picks out a cat, a mouse, and a dog. A n^e condition for this cat, mouse, and dog could pick out a cat and a mouse. One possible

$n^e{}_{s^e}$ condition for a cat and a mouse therefore consists of a cat and mouse, which is exactly what the ns condition for a cat and a mouse consists of.

(8) $n^e_1{}_{s^e_1}$ (cat, mouse) = cat, mouse
where s^e_1 (cat, mouse) = cat, mouse, dog
ns (cat, mouse) = cat, mouse

With a straightforward generalization this leads to the claim that any x that is ns for y, is also $n^e{}_{s^e}$ for y.

The analogous relation between $n^e{}_{s^e}$ conditionality and s^i, s^e, s^{ie}, n^i, n^e, and n^{ie} conditionality is illustrated below.

(9) $n^e_2{}_{s^e_2}$ (cat, mouse) = white cat, mouse
where s^e_2 (cat, mouse) = cat, mouse, white cat
s^i_1 (cat, mouse) = white cat, mouse

(10) $n^e_3{}_{s^e_3}$ (cat, mouse) = cat, mouse, dog
where s^e_3 (cat, mouse) = cat, mouse, dog, elephant
s^e_1 (cat, mouse) = cat, mouse, dog

(11) $n^e_4{}_{s^e_4}$ (cat, mouse) = white cat, mouse, dog
where s^e_4 (cat, mouse) = cat, mouse, dog, white cat
s^{ie}_1 (cat, mouse) = white cat, mouse, dog

(12) $n^e_5{}_{s^e_5}$ (cat, mouse) = cat, rodent
where s^e_5 (cat, mouse) = cat, mouse, rodent
n^i_1 (cat, mouse) = cat, rodent

(13) $n^e_6{}_{s^e_3}$ (cat, mouse) = cat
where s^e_3 (cat, mouse) = cat, mouse, dog
n^e_1 (cat, mouse) = cat

(14) $n^e_7{}_{s^e_5}$ (cat, mouse) = rodent
where s^e_5 (cat, mouse) = cat, mouse, rodent
n^{ie}_1 (cat, mouse) = rodent

The second step consists in showing that any x that is neither ns, s^i ... nor n^{ie} for y, is still $n^e{}_{s^e}$ for y. There seem to me to be three types of x that fall into this category: (i) x consists of the instantiations of one or more, but not all of the entities of y; (ii) x is not a part of y, neither does x instantiate nor is instantiated by one or more elements of y; (iii) a conjunction of types (i) and (ii). These three types are exemplified in (15).

(15) (i) white cat
(ii) dog
(iii) white cat, dog

(16) to (18) show how they can be picked out by $n^e{}_{s^e}$ functions.

(16) $n^e_{8}{}_{s^e_2}$ (cat, mouse) = white cat
where s^e_2 (cat, mouse) = cat, mouse, white cat

(17) $n^e_{9}{}_{s^e_1}$ (cat, mouse) = dog
where s^e_1 (cat, mouse) = cat, mouse, dog

(18) $n^e_{10}{}_{s^e_4}$ (cat, mouse) = white cat, dog
where s^e_4 (cat, mouse) = cat, mouse, dog, white cat

The conclusion is inevitable. Saying that x is $n^e{}_{s^e}$ for y carries no information whatsoever. Neither does the claim that x is n_s for y.

3. The defender of the original inus idea will point out that there is more to it than merely necessity for sufficiency. In particular, the sufficiency of the n_S condition must be what Mackie (1965: 246), following Marc-Wogau (1962), calls a «*minimal*» sufficiency. That is to say that the sufficient condition may contain no redundant factors. Translated into my framework, this may well be intended to mean that the sufficiency must be intensional. Compare the three subtypes of sufficiency once more.

(1) s^i_1 (cat, mouse) = white cat, mouse
(2) s^e_1 (cat, mouse) = cat, mouse, dog
(3) s^{ie}_1 (cat, mouse) = white cat, mouse, dog

At first sight, I believe, the most clearly redundant element in these sufficient conditions is the dog, which is the extensional factor. Of course, the whiteness of the cat is no less redundant. There is in fact, pace Mackie, no sufficiency without redundancy. At most then, the extensional redundancy is the more perspicuous one. This is not much of an argument for equating minimality with intensionality, of course. Let us nevertheless assume that the equation is correct and see where this hypothesis leads.

What about the necessity in our n_{s^i} conditions? If we look at Mackie's examples, we find that this necessity is *always* extensional. If this is not just a coincidence, one could tender the hypothesis that Mackie's «inus» conditions are really meant as $n^e{}_{s^i}$ conditions.

The argument is still weak. It rests on a questionable equation of a mistakenly attributed minimality with intensionality, and on the unexplained coincidence that the necessity of Mackie's inus examples is always extensional. Yet the following fact strongly corroborates our case. $n^e{}_{s^i}$ conditions subcategorize in two subtypes. Relative to the cat and the mouse, a $n^e{}_{s^i}$ function either yields a «white cat» type value or a «cat» type value.

(19) $n^e_1{}_{s^i_1}$ (cat, mouse) = white cat
where s^i_1 (cat, mouse) = white cat, mouse

(20) $n^e_2{}_{s^i_1}$ (cat, mouse) = mouse
where s^i_1 (cat, mouse) = white cat, mouse

The value of a $n^e_2{}_{s^i}$ function is that of a n function. The relevance of this subcategorization is that it is implied by Mackie's account as well. According to Mackie (1965: 246) a ns condition can be looked upon as a disjunction of all the allegedly minimal sufficient conditions. The inus condition is supposed to be a necessary condition for one such minimal sufficient condition, but Mackie makes it a point that the inus condition may be necessary for more than one minimal sufficient condition and that it is, in fact, a *necessary* condition for whatever the sufficient conditions are sufficient for, if it is necessary for *all* of these sufficient conditions.

I find it rather plausible therefore that what Mackie has drawn attention to with his inus conditions, are in actual fact $n^e{}_{s^i}$ conditions. If this is correct, I propose that the term «inus condition» be written off. Its acronymic suggestion is insufficient (see § 2) and, trivially, the best term for a $n^e{}_{s^i}$ condition is «$n^e{}_{s^i}$ condition».

An interesting surprise still awaits us. It is clear that Mackie is mainly interested in the $n^e{}_{s^i}$ conditions that are *only* $n^e{}_{s^i}$ i.e. not also n. It so happens that there is a most perfect label for this subtype. The $n^e{}_{s^i}$ conditions in question are always $s^i{}_{n^e}$. Conversely, every $s^i{}_{n^e}$ condition is of this $n^e{}_{s^i}$ type.

(21) $s^i_1{}_{n^e_1}$ (cat, mouse) = white cat
where n^e_1 (cat, mouse) = cat

This completes my analysis of inus conditions. To sum up, I claim that the inus phenomenon has thus far been insufficiently understood and that one should shelve the term «inus condition» and speak about «$n^e s^i$» and «$s^i n^e$» conditions instead. It goes without saying that Mackie must be credited for having drawn attention to these $n^e s^i$ and $s^i n^e$ conditions. The notion of $s^i n^e$ conditionality, in particular, is an interesting one. In line with the history of the term «inus condition», it may well be useful for the study of causality and there is already sufficient evidence for its usefulness in modal logic. But this would be another story. ([3])

Belgian National Science Foundation J. VAN DER AUWERA
University of Antwerp (UIA)

REFERENCES

APOSTEL, L. (1974) *Matière et forme. I. Introduction à une épistémologie réaliste* (Gent: Communication and Cognition).

BENNET, J. (1976) *Linguistic Behaviour* (Cambridge: Cambridge University Press).

BROAD, C.D. (1930) «The Principles of Demonstrative Induction (I)», *Mind* XXXIX. 302-317.

— (1944) «Hr. von Wright on the Logic of Induction (I)», *Mind* LIII. 1-24.

HILPINEN, R. (ed) (1970) *Deontic Logic: Introductory and Systematic Readings* (Dordrecht: Reidel).

KIM, J. (1971) «Causes and Events: Mackie on Causation», *The Journal of Philosohpy* 68. 426-441; (1975-reprint) Sosa (ed), 48-62.

MACKIE, J.L. (1965) «Causes and Conditions» *American Philosophical Quarterly* 2. 245-264; (1975 - partial reprint) Sosa (ed), 15-38.

MARC-WOGAU, K. (1962) «On Historical Explanation», *Theoria* XXVIII. 213-233.

PLATTS, M.d.B. (1979) *Ways of Meaning. An Introduction to the Philosophy of Language* (London/Henley/Boston: Routledge & Kegan Paul).

SCRIVEN, M. (1964) Review of E. Nagel *The Structure of Science*, *Review of Metaphysics* XVII. 403-424.

SEARLE, J.R. (1979) «What Is an Intentional State?», *Mind* LXXXVIII. 74-92.

SOSA, E. (ed) (1975) *Causation and Conditionals* (Oxford: Oxford University Press).

SUPPES, P. (1970) *A Probabilistic Theory of Causality* (Amsterdam: North-Holland).

SUPPES, P. et al (eds) (1973) *Logic, Methodology and Philosophy of Science IV* (Amsterdam: North-Holland).

TRANØY, K.E. (1960) *Vilkårslogikk I* (Bergen/Oslo: Universitetsforlaget).

VAN DER AUWERA, J. (1981) *Regaining Speculative Grammar. Speech Acts, Logic, and Focus* (Ann Arbor, Michigan: University Microfilms International).
VANQUICKENBORNE, M. (1969) «An Analysis of Causality in Everyday Language» *Logique et Analyse* 12. 311-328.
VON WRIGHT, G.H. (1941) *The Logical Problem of Induction* (Helsingfors).
— (1942) «Några anmärkningar om nödvändiga och tillräckliga betingelser», *Ajatus* II. 220-239.
— (1951) *Treatise of Induction and Probability* (London: Routledge and Kegan Paul).
— (1968) «Deontic Logic and the Theory of Conditions». *Crítica* 2. 3-25; (1970 - reprint) Hilpinen (ed), 159-177.
— (1971) *Explanation and Understanding* (Ithaca, N.Y.: Cornell University Press).
— (1973) «On the Logic and Epistemology of the Causal Relation», Suppes et al (eds), 293-312; (1975 - reprint) Sosa (ed), 95-113.
— (1974) *Causality and Determinism* (New York/London: Columbia University Press).

NOTES

(1) The mentor of this group is G.H. von Wright. For nearly forty years he has insisted on the importance of increasing our understanding of conditionality. See VON WRIGHT (1941, 1942, 1951, 1968, 1971, 1973, 1974). See further also Broad (1930, 1944) and Tranøy (1960).

(2) To forestall misunderstandings, it is good to stress that the animals to be used in the illustrations, are all *indefinite non-specific* ones.

(3) See VAN DER AUWERA (1981). The latter also contains a more developed theory of conditionality. The analysis of inus conditionality presented there (Van der Auwera, 1981: 192-196) is to be superseded by the present one.