A SYSTEM OF TEMPORALLY RELATIVE MODAL AND DEONTIC PREDICATE LOGIC AND ITS PHILOSOPHICAL APPLICATIONS (*)

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2.2. *The temporally relative distinction necessitas consequentiae vs. necessitas consequentis*

2.2.1. *The temporally relative notions of necessary- and sufficient condition*

Łukasiewicz was not the only philosopher who used temporally relative modal notions, R. Taylor did as well in his well-known argument for fatalism. But whereas Łukasiewicz tried to get rid of the temporal character of a sentence like 'when p, it is necessary that p', Taylor did not recognize this character of the modalities involved in his argument: we shall see that the concepts of necessary- and sufficient condition upon which his reasoning depends are to be defined in terms of the notion of temporal necessity.

One may say that the logical mentality of Taylor is akin to that of Łukasiewicz. Both hold the view that the so called principle of bivalence (every proposition is either true or false) is inconsistent with the contingency of (part of) the future. However, their metaphysical positions are opposed. Łukasiewicz is an indeterminist, Taylor is a fatalist.

A first reason to analyse Taylor's argument is the fact that in my system of deontic logic QDTL of chapter III, based upon QMTL, 'Ought implies Can' is given a practical interpretation in terms of the concept of temporal necessity, that discrimintates between that which has been made impossible by the past and what has not. This implies an acceptance of fatalism with respect to the past, and a rejection of fatalism with respect to the future.

The system must therefore enable us to refute arguments that condemn this position as inconsistent.

R. Taylor's fatalism

In an article in the Philosophical Review 71 (1962): 56-66 and in chapter 5 of his book Metaphysics (Prentice Hall, 1963) R. Taylor tries to furnish a proof for fatalism. He arrives at his fatalism through the principle of bivalence, basing his proof on the statement that bivalence implies fatalism. It is my intention to demonstrate that the grounds which Taylor adduces for this statement are insufficient.

Taylor's argumentation proceeds as follows: at first he provides an argument in favour of fatalism with regard to the past, and next he provides an analogous argument which allegedly furnishes proof for fatalism with respect to the future. He claims that these arguments are formally identical. So, if we accept the first argument, we have to accept the second as well and we find ourselves fatalists.

In my opinion the first argument is sound, whereas the second is not. I shall demonstrate this and by doing so prove, that the two arguments do not have the same structure and therefore are not identical.

The notions of necessary- and sufficient condition are at the centre of the argument. Taylor starts from the following presuppositions:

1. The principle of bivalence:
   Any proposition or statement whatever is either true or, if not true, then false (tertium non datur).
2. If a state of affairs A is sufficient for a state of affairs B, A cannot occur without B, i.e. A is a sufficient condition for B.
3. If a state of affairs A is necessary for a state of affairs B, B cannot occur without A, i.e. A is a necessary condition for B.
4. From 2. and 3. it follows, that if A is a sufficient consition for B, B is a necessary condition for A and that, if A is a necessary condition for B, B is a sufficient condition for A.
5. No agent can perform any given action if there is lacking, at the same or any other time, some condition necessary for the occurrence of that act.
6. The mere passage of time has no causal effect upon anything.

Case I Argument in favour of fatalism with respect to the past.

Suppose I read a morning paper to find out whether a sea-battle took place yesterday and that, if I read that a sea-battle did indeed take place, this ensures (is a sufficient condition) that that sea-battle took place, and that, if I see another news-item in the paper in which nothing is said about a sea-battle, this is a sufficient condition that no sea-battle took place.

Call the first act P, the second P′ and represent the sentence 'A sea-battle occurred yesterday' and 'No sea-battle occurred yesterday' by 'q' and '¬q' respectively.

Then we can argue as follows:

1 If 'q' is true, then it is not within my power to do P′ (for in case 'q' is true, then tere is, or was, lacking a condition essential for my doing P′, the condition, namely, of their being no naval battle yesterday).
2. But if '¬q' is true, then it is not within my power to do P (for a similar reason).
3. But either 'q' is true or '¬q' is true.
4. Either it is not within my power to do P, or it is not within my power to do P′.

Case II Argument in favour of fatalism with respect to the future.

Now suppose that I am a naval commander and that a certain order on my part is a sufficient condition that a sea-battle will take place tomorrow, and that another order on my part is a sufficient condition that a sea-battle will not take place tomorrow.

Call the first act P and the second P′ and represent the statements 'tomorrow a sea-battle will take place' and 'tomorrow a sea-battle will not take place' by 'q' and '¬q' respectively. Then we can argue as follows:

1. If 'q' is true, then it is not within my power to do P′ (for in case 'q' is true, then there is, or will be, lacking a condition essential for my doing P′, the condition, namely, of there being no naval battle tomorrow).
2. But if '¬q' is true, then it is not within my power to do P (for a similar reason).
3. But either 'q' is true or '¬q' is true.
4. Either it is not within my power to do P, or it is not within my power to do P′.

A definition of 'sufficient –' and 'necessary condition'

What should we think of the notions of sufficient and necessary condition?

On the one hand these are not to be interpreted as truth-functional; for (if 'P' and 'Q' are names of events and 'p' renders 'P takes place' and 'q' 'Q takes place') then the negation of 'P is a sufficient condition for Q' would be 'P takes place and Q does not take place' ($\neg(p \supset q)$ or $(p \wedge \neg q)$), which is too strong. Accordingly such a definition would be too weak.

On the other hand, the use of a necessity-operator would yield too strong a definition, even if it would not be taken as a logical but physical necessity. In some cases these notions are in fact used in this way. For instance, when I say that the presence of fire is a sufficient condition for the presence of oxygen I mean something like: in all physically possible situations in which fire occurs, oxygen occurs too. But in the context of Taylor's argument there is evidently no question of a physical necessity when it is supposed that a certain order on my part is a sufficient condition that a sea-battle will take place tomorrow.

No, Taylor presents a situation that meets all conditions required to render an order on my part sufficient for the occurrence of a sea-battle tomorrow. That is to say, the situation is a moment of a possible world, so that, whatever the further course may be, a sea-battle will take place if I give a command now. This relation of sufficient/necessary condition is dependent on a certain configuration of facts at a certain moment in a possible world ([16]).

Thus I arrive at the following definition of 'sufficient condition' and 'necessary condition':

At time t P is a sufficient condition for Q: $\Box_t(p \supset q)$
At time t P is a necessary condition for Q: $\Box_t(q \supset p)$

The assertion 'at t P is a sufficient condition for Q' is true in a certain world w if and only if 'if P takes place, then Q takes place' is true in all courses u that w can have from t on. This assertion 'at t P is

([16]) Often the notion of causality is used in a similar situation-dependent way in everyday language, cf. 'The cause of the fire was the lightning of a cigarette'.

a sufficient condition for Q', then, does not express anything else but the *temporal necessity at t* of $(p \supset q)$.

At once we see why events – in the future too may be temporally necessary, viz. those events for which there is a sufficient condition in the past. If at time t P lies the past and at time t P is a sufficient condition for Q (which lies in the future), than $\Box_t p$ and $\Box_t(p \supset q)$ and therefore $\Box_t q$. An example: if someone has had himself sterilized in 1978, it is already impossible in 1980 for him to beget a son in 1984.

An analysis of Taylor's arguments

By now the following statements of Taylor will be clear:

a. any state of affairs that is sufficient for another cannot occur without the other occurring too;
b. a state of affairs cannot occur without a state of affairs, which is necessary for it, occurring too.

a. and b. have the structure $\Box_t(p \supset q) \supset \Box_t \neg(p \wedge \neg q)$. (a: It is impossible that, if p is a sufficient condition for q, p occurs without q; b: It is impossible that, if q is a necessary condition for p, p occurs without q). This is a simple logical truth; equivalent to it is the formula $\Box_t(p \supset q) \supset \Box_t(\neg q \supset \neg p)$.

We shall see that the soundness respectively unsoundness of Taylor's arguments depend upon the position of the sufficient and necessary conditions in time, in other words, on the way in which the time indices are placed under the $\Box$, p and q.

Taylor's first argument (Case I) holds good, whereas his second (Case II) does not; in the first argument the premises 1 and 2 are acceptable, in the second they are not, because in the first situation the necessary conditions for the actions in question lie in the past, whereas in the second situation they lie in the future. I shall try to make clear that this is an essential difference by demonstrating that on account of it the two arguments are *not* formally identical.

Let q_t stand for 'a sea-battle occurs at time t' (17)
$p_{t''}$ for 'at time t″ I read in the paper that q_t',
$p^*_{t''}$ for 'at time t″ I read another news-item in the paper in which nothing is said about a sea-battle',
$p_{'t}$ for 'at time 't I give the order for the sea-battle mentioned',
$p^*_{'t}$ for 'at time 't I give another order'.

Case I The necessary condition lies in the past

Suppose *A* the occurrence of a sea-battle at time t is a necessary condition now (at t′) for my reading at time t″ (later than t) that that sea-battle has taken place at time t,
B the non-occurrence of a sea-battle at time t is a necessary condition now (at t′) for my reading at time t″ (later than t) another news-item in the paper.

Then, for $t < t' < t''$ the following obtains

	A		*B*
1.	$\Box_{t'}(p_{t''} \supset q_t)$	presupposition	$\Box_{t'}(p^*_{t''} \supset \neg q_t)$
	This implies fatalism with respect to the past by way of the following steps		
2.	$\Box_{t'}(\neg q_t \supset \neg p_{t''})$	equivalent to 1	$\Box_{t'}(q_t \supset \neg p^*_{t''})$
3.	$\neg q_t$	presupposition	q_t
4.	$\Box_{t'} \neg q_t$	modus ponens (Th. 2, 3.; since $t < t'$)	$\Box_{t'} q_t$
5.	$\Box_{t'} \neg p_{t''}$	principle from modal logic (2., 4.)	$\Box_{t'} \neg p^*_{t''}$

Thus we can accept $(q_t \supset \Box_{t'} \neg p^*_{t''})$ and $(\neg q_t \supset \Box_{t'} \neg p_{t''})$ as premises 1 and 2 (see also Th. 3 in section 1.1.).

(17) We use here a proposition-letter with a time-index, but proposition-letters are not included in the vocabulary of QMTL. They can be added easily, however, to the system as follows:
- add one-place predicate-letters Prop {'P, 'P′, 'P″,...} to the vocabulary (meant as proposition-letters, to be enriched with time-indices)
- a world w is a quintuple instead of a quadruple, such that $w^5 : T \times Prop \rightarrow \{1,0\}$
- $D \models_w P_z[b] \Leftrightarrow w^5(val(z,b), P^1) = 1$
- add to the definition of $wR_\tau u$:
$w^5 \upharpoonright \{\tau' \in T | \tau' \ll \tau\} \times Prop = u^5 \upharpoonright \{\tau' \in T | \tau' \ll \tau\} \times Prop$

Case II The necessary condition lies in the future

Suppose *A* the occurrence of a sea-battle at time t is a necessary condition now (at ″t) for my giving the order at time ′t (earlier than t) for that sea-battle,

B the non-occurrence of a sea-battle at time t is a necessary condition now (at ″t) for my giving another order at time ′t.

Then, for $''t < 't < t$ obtains

	A		*B*
1.	$\Box_{''t}(p_{'t} \supset q_t)$	presupposition	$\Box_{''t}(p^*_{'t} \supset \neg q_t)$

This does not imply fatalism (with regard to the future): in an argument analogous to the one in Case I, the step from 3 to 4 would not be justified, because now *not* $t < {}''t$. At the utmost one may put up the foregoing argument for a $t' > t$ and in this way arrive at $\Box_{t'} \neg p_{'t}$ respectively $\Box_{t'} \neg p^*_{'t}$. But of course this is useless within the context of an argument in favour of fatalism (with respect to the future), because the necessity of $\neg p$ (respectively $\neg p^*$) does not set in until after the moment ′t of ‘realisation’ of $\neg p$ (respectively $\neg p^*$).

We see then that in Taylor's second argument the premises 1 and 2 have a different structure from those in the first argument; we only have to accept $\Box_{''t}(q_t \supset \neg p^*_{'t})$ and $\Box_{''t}(\neg q_t \supset \neg p_{'t})$.

The two arguments are therefore not formally identical; it is only in the first argument that we have to accept the conclusion.

It should now be clear that we can only subscribe to Taylor's 5th presupposition: ‘no agent can perform any given action if there is lacking, at the same or any other time, some condition necessary for the occurrence of that act’ if we add ‘and the agent has no influence on the occurence or the non-occurrence of those necessary conditions’.

If such a necessary condition lies in the past, this is right, but if it lies in the future, this clause turns Taylor's proof into a petitio principii.

In that case fatalism has not been proved but presupposed.

A closing remark. We refuted Taylor's fatalism by pointing out that the principle that underlies his arguments $((\Box(p \supset q) \wedge \neg q) \supset \Box \neg p)$ is valid on certain conditions which were only met in his first argument.

Answering Taylor's fatalism saying that he confuses two readings of 'if p then necessarily q', to be distinguished by the two possible scopes of the modal expression 'necessarily' would not be enough, one has to show that the distinction is semantically meaningful as well. After all his second argument owes its (seeming) cogency to the first one. A refutation must show what is the difference between the two arguments by making it clear why the scope-distinction in the second argument is essential, in contradistinction to the one in the first argument.

2.2.2. *The temporally relative distinction modality de dicto vs. modality de re*

Till now we had cases in which one wanted to do too much with a notion we identified as 'temporal necessity'. A sound intuition embodied by Th 2 led to acceptance of an unsound principle Łukasiewicz) and a fallacious reasoning was set up by Taylor, because of its striking resemblance to a valid one, that is backed by Th 3. But in this way he went too far in neglecting the difference of necessitas consequentiae and necessitas consequentis. Now we turn to a case in which a congenial distinction between modality de dicto and modality de re should have been neglected, but was unjustly stressed.

It is to be found in the interpretations of Plantinga (28) and Kneale (20) of a passage of Aquinas in Summa Contra Gentiles in which the distinction is drawn in order to refute the idea of the incompatibility of Gods knowledge of the future with the contingent character of (part of) it.

However, the relevance of the distinction (and therewith the refutation) is based upon a presupposition here that is disregarded by Plantinga and Kneale. In (1) liber I caput LXVII, 565 Aquinas writes

'Praeterea, si unumquodque a Deo cognoscitur sicut praesentialiter visum, sic necessarium erit esse quod Deus cognoscit, sicut necessarium est Socratem sedere ex hoc quod sedere videtur. Hoc autem non necessarium est absolute, vel, ut a quibusdam dicitur, necessitate consequentis: sed sub conditione, vel necessitate consequentiae. Haec enim conditionalis est necessaria: *Si videtur sedere, sedet*. Unde et, si conditionalis in categoricam transferatur, ut dicatur, *Quod videtur sedere, necesse est sedere*, patet eam *de dicto* intellectam, et *compositam*, esse veram; *de re* vero intellectam, et *divisam* esse falsam. Et sic in his, et in omnibus similibus quae Dei scientiam circa contingentia oppugnantes argumentatur secundum compositionem et divisionem falluntur.'

Plantinga comments in (28), p. 10-11: '... he (i.e. Aquinas) inquires into the truth of (1) What is seen to be sitting is necessarily sitting. For suppose at t_1 God sees that Theatetus is sitting at t_2. If (1) is true, then presumably Theatetus is necessarily sitting at t_2, in which case he was not free, at that time, to do anything but sit. St. Thomas concludes that (1) is true taken de dicto but false taken de re; that is

(1′) It is necessarily true that whatever is seen to be sitting is sitting

is true but

(1″) Whatever is seen to be sitting has the property of sitting necessarily or essentially

is false. The deterministic argument, however, requires the truth of (1″); and hence that argument fails'.

Kneale says about it in (20), p. 237: 'The general sense of this passage is clear. If God has foreknowledge of a proposition about the future, that proposition is necessary in relation to the fact of its being foreknown, but not therefore absolutely or unconditionally necessary.'

These explanations of Plantinga and Kneale disregard an aspect that is necessary for the acceptability of Aquinas' reasoning: their readings spoil the argumentation.

For if the seeing/knowledge takes place *before* the state of affairs that is seen/known then the time to which 'seen' in (1) pertains is earlier than the time of sitting and the two readings of (1), interpreted as a temporal modal sentence, are equivalent. Distinguishing between a de dicto (1′) and a de re (1″) reading of (1) is only a syntactical trick that is worthless from a logical point of view. This is the philosophical message of Th 5 [18].

[18] Perhaps you won't accept the equivalence of (1′) and (1″) on the basis of Th 5,

Here one may object that our criticism is beside the point because it is based upon a temporal analysis of (1) that Plantinga and Kneale do not share. On their own nontemporal interpretation of (1) the difference between (1′) and (1″) remains intact.

This observation, however, true as it may be, is immaterial; for the truth of (1′), being equivalent to (1″) on our own interpretation, is enough for reaching a deterministic conclusion from (divine) providence. This is easily recognized. True knowledge of a proposition is a logically sufficient condition for the truth of the proposition. In all worlds in which it is known that p, p. But then, trivially, for all the courses a world may follow from any moment on it holds that if it is known that p, then p. In our language (adding ad hoc K as an epistemic operator) $\forall y \Box_y (K\phi \supset \phi)$. But if the knowledge is foreknowledge the temporality of the proposition lies after the time of the knowledge and the proposition is temporally necessary as soon as the knowledge is there[19]. In other words: if God has foreknowledge of a proposition about the future that proposition is 'absolutely or unconditionally necessary'.

This kind of reasoning is not applicable to Aquinas' passage. He escapes the conclusion because in his view divine knowledge is beyond time[20]: '... (divina scientia) quae, in momento aeternitatis existens, ad omnia praesentialiter se habet.' Consequently we cannot fix a temporality to the analogous (divine) K-operator and the time-relation on which Th 5 is based has vanished.

However, if you disregard this presupposition of the timelesness of God's knowledge and you interpret 'seeing' in (1) as *fore*knowledge, then (1)[21] is sufficient to lead, on the basis of divine providence, to a

because, owing to the temporal restriction of the quantifier, the equivalence holds, provided that what is seen or known to do something exists at the moment of the seeing or knowing.
Notice, however, that if we add an epistemic operator K to our language and assume as a meaning-postulate:
for any D,w,b if $D \models_w K_z\phi[b]$ then $D \models_w \phi[b]$
the two readings of (1) $\forall y \forall y'(y < y' \supset \Box_{y'} \forall x(K_y\phi \supset \phi))$ and
$\forall y \forall y'(y < y' \supset \forall x(K_y\phi \supset \Box_{y'}\phi))$ are equivalent, both being valid formulas.

(19) See also Prior (30), p. 116.

(20) See Aquinas (1), Liber I caput LXVII, 564.

(21) Even if it is interpreted as a de dicto proposition involving a logical (conceptual) necessity.

deterministic conclusion in terms of temporal necessity; a de dicto – de re distinction will not help you, because either it is irrelevant or it does not exist then from a semantical point of view.

2.3. *Definite descriptions as relatively rigid designators*

In modal contexts sometimes phrases of the form 'the such and such' occur. Usually these are represented in predicate-logic by the string of symbols $\iota x\,\phi(x)$ read as: 'the x that is ϕ' and (1) $\psi\,\iota x\,\phi(x)$ is defined([22]) as $\exists x(\phi(x) \wedge \forall x'([^{x'}/x]\phi(x) \supset x = x') \wedge \psi(x))$([23]) i.e. 'the ϕ is ψ' means 'there is exactly one (object) ϕ and that (object) is ψ'.

A sentence like 'the ϕ is necessarily ψ' may be differently understood according to the scope of the description. In (2) $\Box\,\psi\,\iota x\,\phi(x)$([24]) the description may have

a. small scope:

(3) $\Box\ \exists x(\phi(x) \wedge \forall x'([^{x'}/x]\phi(x) \supset x = x') \wedge \psi(x))$,

the formula represents a de dicto proposition, and

b. large scope:

(4) $\exists x(\phi(x) \wedge \forall x'([^{x'}/x]\phi(x) \supset x = x') \wedge \Box\ \psi(x))$,

the formula represents a de re proposition.

The avoid ambiguities we may use brackets and have in the definition of (1) as definiendum $(\psi\,\iota x\,\phi(x))$ instead of $\psi\,\iota x\,\phi(x)$. Then we distinguish between

(5) $\Box(\psi\,\iota x\,\phi(x))$ as an abbrevation of (3) and

(6) $(\Box\,\psi\,\iota x\,\phi(x))$ as an abbrevation of (4).

Now some definite descriptions may intuitively have a temporality, viz. the time the predicate of the description pertains to. For instance 'the being Jephta meets at t' has a temporality the time t refers to.

([22]) After Russel, see (33).

([23]) We write $\phi(x)$ to indicate that there is at least one free occurrence of x in ϕ; $[^{x'}/x]\phi(x)$ is $\phi(x)$ with all free occurrences of x in ϕ replaced by x' (x' is free for x in ϕ).

([24]) We suppress possible time-indices for a moment.

Thus in the sentence 'Myrjam is the individual which meets Jephta at t' (rendered by the formula

$$(7)\quad \exists x(M_t xj \wedge \forall x'(M_t x'j \supset x = x') \wedge x = m))$$

the part representing the definite description has time t as a temporality, but the corresponding formula

$$(8)\quad \exists x(M_t xj \wedge \forall x'(M_t x'j \supset x = x'))$$

does not have a temporality.

This discrepancy may be overcome by restricting the quantifiers to time t, giving them only the range of those objects that are already in the domain at time t. Then we tet

$(9)\quad \exists \overset{t}{x}(M_t xj \wedge \forall \overset{t}{x}'(M_t x'j \supset x = x'))$ instead of (8) and this formula does have as temporality the time to which t refers([25]).

In general we write

$$(10)\quad \psi\ 1\overset{z}{x}\phi(x) \text{ for } \exists \overset{z}{x}(\phi(x) \wedge \forall \overset{z}{x}'([^{x'}/x]\phi(x) \supset x = x') \wedge \psi(x))$$

An objection may be made at this point. In ordinary definite descriptions such as appear e.g. in (1) the formula beginning with the universal quantifier assures us that there is at most one object fulfilling the predicate of the description $\phi(x)$. But in (10) an object is singled out that is as a ϕ unique at time z; the possibility is left that after z other objects will come into existence that will satisfy $\phi(x)$ as well. So (10) does not guarantee the absolute uniqueness of the ϕ in question.

My answer is that although this remark shows that we are not simply allowed to temporalise quantifiers of definite descriptions, there are definite descriptions in which a temporal restriction on the quantifiers does not matter, viz. those descriptions $1x\phi(x)$ whose open sentences $\phi(x)$ are satisfied in a world w by an object in the domain of w only if that object is an element of the domain of w (exists) at the moment of the temporality of $\phi(x)$.

Examples of such open sentences are easily given: 'meeting Jephta at t', 'being impregnated by someone at t', 'having a cup of coffee with Suzy at t' can only be satisfied by an object that exists at t. We may

([25]) Cf. the definition of temporality in section 1.1.

view this as an existence-postulate for the predicates in question [26].

Assuming this postulate for $\phi(x)$ in (10) (taking for example $b(z)$ as its temporality for some b) (10) does guarantee the absolute uniqueness of the ϕ in question. This idea is reflected in QMTL by the following theorem

Th 7 $\models \forall y(\forall x(\phi(x) \supset \overset{y}{\exists x'}\, x = x') \supset (\psi\ 1x\, \phi(x) \equiv \psi\ 1\overset{y}{x}\phi(x)))$ [27]

Akin is

Th 8 $\models \forall y\, \forall y'(y < y' \supset (\forall x(\phi(x) \supset \overset{y}{\exists x'}\, x = x') \supset (\psi\ 1\overset{y}{x}\phi(x) \equiv \psi\ 1\overset{y'}{x}\, \phi(x)))))$

Indeed the entire formula (10) $\psi\ 1\overset{z}{x}\phi(x)$ has as a temporality the time to which z refers if the temporalities of both ψ and ϕ are earlier than or equal to that of z. To put it more exactly

For arbitrary b temp $(\psi\ 1\overset{z}{x}\phi(x), b) = val(z,b)$ if and only if
temp (ψ, b), temp$(\phi, b) \leqq val(z,b)$ [28]

Thus we may prove a theorem like Th 2 involving formulas in which occur definite descriptions (bearing in mind that we are, on the basis of a meaning-postulate like that just mentioned, sometimes justified to temporalise the quantifiers):

Th 9 $\models \forall y\, \forall y'\, \forall y''(y^{(\prime)} < y'' \supset (\psi_{v'} \eqslantgtr \overset{v^{(\prime)}}{x}\ \phi_y(x) \equiv \Box_{y'}\psi_{y'}\, 1\overset{y^{(\prime)}}{x}\ \phi_y(x)))$,
where
$y^{(\prime)} = y$ if $b(y') \leqq b(y)$ and $y^{(\prime)} = y'$ if $b(y) \ll b(y')$.

Three examples.

Let $M_y x$ stand for: x meets Jephta at time y; $N_y x$ for: x is nervous at time y; $S_y x$ for: x smiles at time y and $C_y x$ for: x cries at time y.

If $'t < t < t' < t''$, then

a. $N_{'t} 1\overset{t}{x} M_t x \equiv \Box_{t'} N_{'t} 1\overset{t}{x} M_t x$ (cf $y^{(\prime)} = y$)

b. $S_t 1\overset{t}{x} M_t x \equiv \Box_{t'} S_t 1\overset{t}{x} M_t x$ (cf $y^{(\prime)} = y$)

c. $C_{t'} 1\overset{t'}{x} M_t x \equiv \Box_{t''} C_{t'} 1\overset{t'}{x} M_t x$ (cf $y^{(\prime)} = y'$)

(26) See also note 7.
Notice that this postulate does not hold for all predicates having a temporality, consider 'being begot at time t by someone'; here the opposite postulate rather holds: $\exists\overset{t}{x}B_t xj$ does not make sense, whereas $\exists x B_t xj$ does (j is substituted for 'someone').

(27) For proofs of theorems see Appendix of (10).

(28) See the definition of temporality, in section 1.1.

You may remark that Th 9 is ambiguous: it is not clear whether the description of $\Box_{y''}\psi_{y'} 1\overset{y^{(')}}{x}\phi_y(x)$ (and of the formulas at the right hand of the equivalences a. b. and c.) has little scope or large scope. The reason for not using brackets here is, that we would suggest a distinction that does not matter: in Th 9 we have another case in which there is no difference, from a semantical point of view, between a de dicto and a de re modality. We may prove

Th 10 $\models \forall y \, \forall y' \, \forall y'' (y^{(')} < y'' \supset (\Box_{y''}(\psi_{y'} 1\overset{y^{(')}}{x}\phi_y(x)) \equiv (\Box_{y''}\psi_{y'} 1\overset{y^{(')}}{x}\phi_y(x))))$, where
$y^{(')} = y$ if $b(y') \lesseqqgtr b(y)$ and $y^{(')} = y'$ if $b(y) \ll b(y')$.

It shows on what conditions definite descriptions are immune from differences of scope in modal contexts.

As an immeditate consequence of Th 9, we get

Th 11 $\models \forall y \, \forall y' (y < y' \supset (1\overset{y}{x}\phi_y(x) = v \equiv \Box_{y'} 1\overset{y}{x}\phi_y(x) = v))$ where v is an ontological term.

Now, if we define 'rigid designator' as 'a term that designates the same object in all possible worlds' [29], we see that definite descriptions can be relatively rigid designators [30]. They behave like names in modal sentences that have a later temporality than the definite descriptions themselves in the sense that also in these sentences we can substitute salva veritate definite descriptions for names and vice versa, even when they occur within the scope of a modal operator:

Th 12 $\models \forall y \, \forall y' (y < y' \supset (1\overset{y}{x}\phi_y(x) = v \supset (\Box_{y'}\psi(v) \equiv \Box_{y'}(\psi \, 1\overset{y}{x}\phi_y(x)))))$,

([29]) See Kripke (21).

([30]) Although the author of the Nicomachean Ethics could have been someone other than the man who in fact is the author (Aristotle), as soon as the one who wrote the N.E. (Aristotle) had written it, it was necessary that Aristotle is the author of the N.E.: in all possible courses the world could have from the moment of completion of the work on, the man who wrote the N.E. is Aristotle. The definite description designates the same object in all worlds that are possible from the temporality of the description on. This may throw some light on a remark of Kripke (21), p. 83, note 10 that 'Some philosophers think that definite descriptions, in English, are ambiguous, that sometimes 'the inventor of bifocals' rigidly designates the man who in fact invented bifocals'. Kripke himself is 'tentatively inclined to reject this view...'.

if x does not occur free in $\psi(v)$ ([31])

This is of vital importance in deontic contexts too. Once again consider the story of Jephta. By virtue of his promise he had the (prima facie) duty to immolate what would meet him at his return home. But although it is a fact that the individual that met him was (his only daughter) Mirjam, this does not imply that he had the (prima facie) duty to immolate Mirjam. Until he has met her the identity is not necessary: it was possible that the one who would meet him was an individual different from Mirjam: $\neg\Box_{'t}(1\overset{t}{x}M_t x = m)$. In this context the definite description is not a rigid designator. However, if we change the context substituting $t'(> t)$ for 't it is: we have both versions $\Box_{t'} 1\overset{t}{x}M_t x = m$, the identity *is* necessary at t'. In chapter IV we will see as a result of this, applying Th 12 ([32]), in what sense the sentences 'Jephta has the duty to immolate what met him at his return home' and 'Jephta has the duty to immolate Mirjam' are equivalent after all.

([31]) Cf. also Th 13 $\models \forall y(1\overset{y}{x}\phi(x) = v \supset (\psi(v) \equiv \psi 1\overset{y}{x}\phi(x)))$ if x does not occur free in $\psi(v)$.
In Th 12 and Th 13 we use $\psi 1\overset{y}{x}\phi_{(y)}(x)$ as short for:
$\exists\overset{y}{x}(\phi_{(y)}(x) \wedge \forall\overset{y}{x}'([^{x'}/x]\phi_{(y)}(x) \supset x = x') \wedge [^{x}/v]\psi(v))$

([32]) Or rather a deontic counterpart of it.

III. A SYSTEM OF QUANTIFICATIONAL DEONTIC TEMPORAL LOGIC: QDTL

In chapter I we saw in what difficulties a moral agent lands if he uses the languages of the current systems of deontic logic in forming directives telling what he ought to do now. It turned out that, in order to from sufficiently specific moral cues, looking at sets of (nearly) deontically perfect worlds is not sufficient. Every moment we must ask ourselves which of those worlds that from now on can still originate out of our world are as ideal as possible; we have to choose from the possibilities that remain. Only in view of what is now still possible – given the past – we can form sufficiently specific cues.

Chapter II offered us a logic dealing with this time-related modal notion. Temporal necessity was defined in terms of a strict-accessibility relation. Some worlds are accessible – at time t for our world, viz. those worlds whose courses – until t are identical with the course of our world – until t. These are the worlds that have at time t the same past as our world. Some of these worlds, that are accessible – at t for our world, are (nearly) (as) *perfect* (as possible) *in relation to our world from time t.*

Statements that express practical moral cues refer to this group of worlds. So these cues are based upon the just mentioned accessibility relation. In order to get a system of deontic logic that defines validity for a language of such cues we simply extend the system QMTL([1]).

1. *QDTL: a deontic extension of QMTL*

1.1. *Language and semantics*

We expand QMTL with deontic elements in the following way:

Alphabet : add a three-place operator O

Formulas : if ϕ and ψ are formulas and z is a temporal term, then $(\phi\, O_z\, \psi)$ is a formula

Definitions : $(\phi\, P_z\, \psi) = \neg(\phi\, O_z \neg\psi)$

$O_z \psi = ((\phi \supset \phi)\, O_z\, \psi)$

Semantics : A QDTL structure D is a quintuple, i.e. a QMTL structure with Q as a fifth element added so, that $Q: W \times T \times Pow(W) \rightarrow Pow(W)$ so that for each $w \in W$, $\tau, \tau' \in T$, $Y \in Pow(W)$:

a. $Q.(w,\tau,Y) \subseteq Y$

b. if $Q(w,\tau,Y) = \emptyset$ then $Y \cap \{u \in W \mid wR_{\tau}u\} = \emptyset$

c. $Q(w,\tau,Y) = Q(w,\tau, Y \cap \{u \in W \mid wR_{\tau}u\})$

d. if $\tau \ll \tau'$ then, if $wR_{\tau'}u$, then $Q(w,\tau,Y) = Q(u,\tau,Y)$

Truth definition : $D \models_{w} (\emptyset_{z}\psi)\,[b] \Leftrightarrow$ for each $u \in Q(w, val(z, b), \{v \in W \mid D \models_{v} \phi\,[b]\})$: $D \models_{u} \psi\,[b]$

([1]) Other authors who constructed systems of time – dependent ought propositions are Chellas (7), McKinney (27), Thomason in (17), Åqvist and Hoepelman in (17).

The *temporality* of $(\phi\, O_z\, \psi)$ under the assignment b is val (z,b).

Some characteristic *valid formulas*:

Th 14 $\models \forall y\,(\Box_y \phi \supset (\psi\, O_y\, \phi))$

Th 15 $\models \forall y\, \forall y'\,(y < y' \supset (O_{y'}\, \phi_y \equiv \phi_y))$

Th 16 $\models \forall y\, \forall y'\,(y < y' \supset (O_{y'}\,(\phi_y \supset \psi) \equiv (\phi_y \supset O_{y'}\, \psi)))$

Th 17 $\models \forall y\, \forall y'\,(y < y' \supset ((\phi_y\, O_{y'}\, \psi) \equiv (\phi_y \supset O_{y'}\, \psi)))$

Th 18 $\models \forall y\, \forall y'\,(y < y' \supset ((\phi\, O_y\, \psi) \supset \Box_{y'}\,(\phi\, O_y\, \psi)))$

Furthermore we have the deontic counterparts of Th4-Th13 involving 'ontological' quantifiers and definite descriptions.

1.2. *Comments on the system*

We have formulas of the form $(\phi\, O_t\, \psi)$, the intuitive interpretation of which is:

In all worldcourses that are possible from t onwards and are as perfect as possible – given that ϕ is the case in them – ψ is the case.

It should be noted that instead of 'given' we do not write 'except'. We do not want to suggest that ϕ always represents something that ought not to be the case.

Furthermore, these deontically perfect worldcourses in which ϕ is (yet) the case, do not need to look like unconditionally perfect worldcourses in all respects putting aside ϕ.

As to the last point, compare the situation with a bridal gown which has been stained indelibly. A perfect gown is completely white. Now we must make the gown as fine as possible in spite of the stain by dying it. The stain, then, is not the only detail in which the gown has changed from its maiden state.

A deontically nearly perfect worldcourse from t on may depart from a worldcourse that is perfect from t on – putting aside that ϕ is the case –, in many more respects than only its shortcomings.

Formulas of the form $(\phi\, O_t\, \psi)$ are used to express a commitment. When ϕ is valid (for instance $\phi = (\chi \supset \chi)$ we may have an unconditional obligation $O_t \psi$, which is to be read as: in all as good as possible courses this world can have from t on ψ is the case.

To find out what the truth-value of such a formula is we need a kind of ethical point of view Q that tells us every time how the course should continue. This Q indicates at each point of time t which of those worlds that are still possible from t on are deontically as perfect as possible. If you have a commitment, the Q must choose from these worlds that are still possible at a certain moment and in which something additional is the case.

So semantically the difference between an unconditional obligation and a commitment is, that with the first you build up your set of deontically perfect worlds starting from the past and with the second from the past + the relevant condition. If that condition, represented by ϕ, lies already in the past it is not something 'additional' anymore. The commitment has changed into an unconditional duty (see also below section 2.2.1.).

The function Q meets some requirements:

a. is a straightforward adaptation of the parallel condition for the (non temporal) choice function R of traditional systems. See Lewis (23).
b. states that Q 'cannot choose' the best worlds for w at a moment τ out of Y only if no world in Y is accessible for w at τ;
c. says that choosing the best worlds for w at a moment τ out Y is choosing the best of those worlds out of Y that are accessible for w at that moment τ. Together with a. it gives c'. $Q(w,\tau,Y) \subseteq Y \cap \{u \in W \mid wR_\tau u\}$. This is the accessibility requirement. It yields the validity of a practical 'Ought implies Can' principle we encountered in chapter I, 2.2. Furthermore c'. implies that the impossible 'commits' you to anything: $\models \forall y (\Box_y \neg\phi \supset (\phi O_y \psi))$ (2);
d. states that, when two worlds have the same past at some point in time τ, they also have at each time earlier than τ the same set of deontically (nearly) perfect worldcourses. It gives us $\models \forall y \forall y' (y < y' \supset ((\phi O_y \psi) \supset \Box_{y'} (\phi O_y \psi)))$. In this way we preserve the validity of Th 2 of QMTL for QDTL.

The other theorems will be reviewed in the next sections (3).

(2) A 'paradox of commitment'. See also note 16.
(3) For proofs see the appendix of van Eck (10).

2. *The workability of QDTL*

In testing the adequacy of the nowadays prevalent systems of deontic logic with respect to their task of providing a language of sufficiently specific cues for the moral agent in chapter I we exposed a number of serious defects. In the next sections we will follow the criticism point by point and see how the problems are solved by our system QDTL.

2.1. *Some ethical concepts*

At first we encountered some notions, important in the context of moral practice.

2.1.1. *Prima facie- and actual obligation; the 'ceteris paribus' question*

We considered in section 1.2. of chapter I a situation in which John and Suzy had made an appointment. John promised Suzy (p) to have a cup of coffee with her (q). We said (1) 'John ought to have a cup of coffee with Suzy'.

It was noted that (1) cannot be interpreted in terms of deontically perfect worlds simpliciter, because its truthvalue is dependent on the moment of time to which the 'ought' pertains. Thus I interpret the sentence in terms of deontically perfect worlds-from t on: $O_t q$ (where t is meant as a moment of time just after John's promise). This means: in all courses of the world which are as good as possible from t on q is the case.

However, if we want to characterize the proposition as conveying a prima facie-or an actual duty, we have to consider the time of its fulfilment (q). Let us suppose that the time of the date is t+7. Then (1) has to be formulized as $O_t\, q_{t+7}$.

The formula now reveals a course of time between the moment at which the obligation has come into force (t) and the moment of its fulfilment (t+7). That means that the formula leaves room for other things (not) being equal.

So we have a prima facie duty here, just like the situation suggested: (1) is an elliptic sentence bearing a tacit 'ceteris paribus' proviso meaning

1. provided no situations will arise that render the realization of q impossible;
2. provided no stronger obligations will arise, the fulfilment of which renders q impossible.

An actual duty, on the other hand, is a duty that does not leave room for the other things (not) being equal. If at t+7 the conditions of the 'ceteris paribus' proviso are still met, we have the actual duty $O_{t+7}\, q_{t+7}$: there is no longer any room between the moment of realization of $(\neg)\, q$ and the obligation to see to it that q; nothing that would destroy the 'ceteris paribus' conditions can intervene any longer.

But the question now is: what, then, does the formula $O_t\, q_{t+7}$ say about a *real* obligation of John? This may be called the 'ceteris paribus' question.

It is this question that proved to be so fatal to the current systems (see chapter I, 4).

At first sight it seems that the present system is not better off, because John can evade an actual obligation by seeing to it that the 'ceteris paribus' proviso is not satisfied, for instance by

I killing Suzy at t+2 (r^{I}_{t+2}) which is forbidden in itself[4];

II killing himself at t + 2 (r^{II}_{t+2}) which is not forbidden in itself[5];

III leaving for Australia at t+2 (r^{III}_{t+2}) in order to visit his dying father (s) – which he ought to do (a stronger obligation) –;

Yet another case is

IV Suzy dies at t+2 (r^{IV}_{t+2}) – John not being involved in the matter.

(4) For the meaning of this phrase see section 2.1.3.

(5) If you think I and II awkward examples, being far-fetched in view of the light obligation, you may read for q_{t+7}: John marries Suzy at t+7, imagining the Suzy Mae story after John's first outrage, viz. impregnating Suzy.

In all cases we have:
$\Box_{t+3}\neg q_{t+7}$ and so $O_{t+3}\neg q_{t+7}$ because of Th 14 and $\Box_{t+1}(r_{t+2}\supset\neg q_{t+7})$ (cf. also Th 1 of chapter II).

IV is the simplest case from a moral point of view. From t+2 on John can no longer fulfil his obligation. All worldcourses that were perfect from t onwards have become inaccessible at t+2 by an accident.

Nor is John to be blamed in case III since we have $\Box_{t+1}(s\supset r^{III}_{t+2})$ and $O_{t+1}s$, so $O_{t+1}r^{III}_{t+2}$ and now he does what he ought to do, because at every moment he aims at the best world. Only, the best world seen from t+1 is different from an ideal world seen from t.

In case II, on the other hand, he does not. By r^{II}_{t+2} he blocks up the possibility to make the world take the course that from t on was deontically desirable.

The same obtains for case I; furthermore it yields an additional loss of ethical quality for our world.

Let us go back to sentence (1) for a moment. Why is – in natural language – a sentence like (1) nearly always used without mentioning the 'ceteris paribus' proviso? I think because 'ceteris paribus' does not become 'operative' until (1) is the case *and* it turns out that nevertheless $V(\neg q_{t+7},w)=1$ [6]. Then John can be called to account with questions like 'How is it that $V(q_{t+7},w)=0$?' and 'Why did not you do that?' A morally satisfactory answer should be '$V(O_{t+7}q_{t+7},w)=0$' or even '$V(O_{t+7}\neg q_{t+7},w)=1$'. Further questions must be answered by reference to III or IV.

This is the answer of our system to the 'ceteris paribus' question. John cannot sufficiently defend himself by simply stating 'other things were not equal'. A reference to I or II is not satisfactory, even though it does guarantee that other things were not equal, because in these cases he does not aim at the best world. More formally $O_{t+2}\neg r^{I}_{t+2}$ and $O_{t+2}\neg r^{II}_{t+2}$ because of $O_{t+2}q_{t+7}$ and $\Box_{t+2}(r_{t+2}\supset\neg q_{t+7})$.

Thus we see what the prima facie obligation rendered by O_tq_{t+7} says about a 'real' obligation of John: any prima facie obligation $O_t\phi_{t'}$

[6] I write $V(\phi,w)=1$ for 'ϕ is true in (our) world w'.

(where $t < t'$) implies an actual duty $O_t \Diamond_t \phi_{t'}$ not to make ϕ impossible, in other words not to violate any condition then (at t) necessary for $\phi_{t'}$.

The very relation between the time-indices of the subformulas of $O_t\phi_{t'}$ determines whether the formula expresses a prima facie duty or an actual duty (7). However, there are three possible relations between the indices.

Summing up, then,

1. $t < t'$ (t′ later than t)
   The formula says, that in all deontically best courses the world can have from t on, $\phi_{t'}$ is the case and so gives a cue for the agent, who always should aim at the best possible course. But between t and t′ anything can happen; the just mentioned set of deontically best courses – from t on can become inaccessible, or in another way another perfect set may arise (for instance, when an obligation is overruled by a stronger duty). This means that we have a prima facie ('ceteris paribus') obligation here.
2. $t = t'$
   Now nothing can happen between t and t′; an 'other things being equal' clause has become senseless. The formula expresses an absolute duty.
3. $t' < t$
   In this case there is no question of 'ought' or 'obligation'. At time t ϕ_t is already a part of all possible further courses of the world and a fortiori of all best possible further courses.
   We cannot neglect (the truth of) ϕ_t, when we have to decide what now (on time t) are our relatively perfect worlds. See also section 2.2.2.

2.1.2. *Primary and secondary duty; conditional and unconditional obligation*

Returning to our story, $O_t q_{t+7}$ functions as a cue for John expressing a primary duty. Yet, simply because he did not feel like going, John

(7) The difference between a formula expressing a prima facie commitment and a formula expressing an absolute commitment runs parallel to the difference between a prima facie- and actual obligation. See section 2.2.1.

decided (say at t+5) not to go (see chapter I,1.3.), i.e. not to fulfil his obligation.

But not following the primary cue does not mean being without any directives, for he had a reserve cue to the effect hat (2) if he would not go, he would have to apologize next day (r_{t+10}). This may be formalized as e.g. (3): ($\neg q_{t+7} O_{t+5} r_{t+10}$).

Clearly proposition (2) is not about worldcourses that are perfect from a certain moment on; it is about worldcourses that are perfect from that moment on – given the truth of $\neg q_{t+7}$ in it –. Or rather it is about non perfect world courses in which the damage that will be done is neutralized as much as possible. The formula expresses a secondary duty which is conditional: it says what John ought to do if he will not meet his primary obligation.

Now, John, in fact did not fulfil his obligation and in this way the secondary conditional obligation passed over to an unconditional (if prima facie) one. How is this to be formalized? In our story other things remained equal, so looking at the situation at t+8 we have ($\neg q_{t+7} O_{t+8} r_{t+10}$). But this formula, together with $\neg q_{t+7}$, gives the unconditional prima facie $O_{t+8} r_{t+10}$ (cf. Th 17. See section 2.2.1. on commitment and detachment for a more elaborate treatment): the initially secondary conditional duty has assumed the role of a primary (if reparational) cue now, beside which e.g. ($\neg r_{t+10} O_{t+8} s_{t+14}$) may function as a new secondary duty etc.

In this way our system shows the nature of the interrelation between primary and secondary obligations as sketched in chapter I, section 1.3., especially the relativity of these notions.

Some additional remarks.

Notice that John, in spite of his negative decision, still had the primary obligation to realize q_{t+7}, which in fact became an actual duty. So John was to be blamed for not keeping his promise. But then, if he neighter fulfilled the reparational duty which this gave rise to, he was to be blamed another time. 'That you did not come was bad enough, but not making an apology is the limit.'

One can also use formulas of the form of (3) to indicate the status of obligations that are overruled by a stronger obligation. So in case III of section 2.1.1. e.g. ($\neg r_{t+2} 0_{t+1} q_{t+7}$) might be added to express the fact that John's initial obligation does not disappear completely after all: you can justify yourself against a reproach that you did not fulfil an obligation by pleading a stronger obligation only if you did in fact fulfil that obligation (ceteris paribus!) – or at least its then necessary conditions.

We used the term 'unconditional obligation' here in the sense of 'obligation not connected with a specific condition'. It was represented by the formulas $O_t q_{t+7}$, $O_{t+7} q_{t+7}$ and $O_{t+8} r_{t+10}$, it's form being $O_t \phi_{t'}$ for $t \leq t'$. But in section 1.3. of chapter I we distinguished another meaning, viz. that of 'absolute obligation' that is an obligation you ought to fulfil, whatever the circumstances may be, i.e.: in all circumstances that may arise until the time of its fulfilment. Thus, if you want to express an absolute duty with sentence (1) of section 2.1.1. the formula $\forall y' \; (t \leq y' \leq t+7 \supset O_{y'} q_{t+7})$ seems suitable at first sight. Yet no one who wants to express an absolute cue to John can vouch for its risky implication: $\forall y' \; (t \leq y' \leq t+7 \supset \Diamond_{y'} q_{t+7})$ (cf. Th 14).

If you want to say that John now has an absolute duty to realize q_{t+7}, you do not want thereby to imply that no situation will render the realization of q_{t+7} impossible. You only do not admit stronger obligations in the meantime: no alleged obligation may overrule this one.

So even this absolute obligation is subject to the condition that its fulfilment is possible: $\forall y' \; (t \leq y' \leq t+7 \supset (\Diamond_{y'} q_{t+7} \supset O_{y'} q_{t+7}))$

Now you will not accept a justification of John of not fulfilling this obligation by reference to III (section 2.1.1.). IV is his only escape.

2.1.3. *Conflict of duties; the Jephta-dilemma*

In dealing with the problem of conflicts of duties as embodied in the Jephta dilemma we distinguished between giving rise to- and creating a conflict of duties. In fact we encountered already a conflict of duties in section 2.1.1. in the case of John's obligation to see Suzy and his obligation to visit his father, a situation like in Hintikka's example (see chapter I, 1.4.), in which a prima facie duty to fulfil a promise was overruled by a stronger one. We claimed in chapter I that there is no relevant difference between Jephta's case and this example from a logical point of view: you can *not* infer that John ought not to give the promise, nor that Jephta did something forbidden.

John's case can be rendered by the set

$$\{p_{t-1}, O_t q_{t+7}, O_{t+1} r, \Box_{t+1}(r \supset \neg q_{t+7}), O_{t+1} \neg q_{t+7}\}$$ (8)

John's initial duty, seen from t, to realize q_{t+7} is overruled by a stronger obligation arisen at t+1. Fulfilling this obligation demands refraining from doing q_{t+7}, this being a necessary condition for r: according to our system all conditions that are (practically or logically) necessary for realizing what ought to be the case ought to be realized.

Here we see what happens when an obligation is overruled by a stronger one. What was the best world seen from t is not a best world any longer seen from t+1; a different set of worlds, disjoint from the earlier one has become the best one from a later point of view (t+1).

Surely, John cannot be blamed for that, we cannot deduce the actual duty not to give the promise he did (see also chapter I, 1.4.). Yet we feel morally ill at ease when we do not meet a promise even when it is overruled. The semantics of our system fits in with this feeling in the following way.

If we define a state of affairs rendered by 'ϕ' as deontically neutral at time t in w if $V(O_t,\phi,w) = V(O_t \neg\phi,w)(=0)$, we see that when somebody incurs an obligation by way of a promise or otherwise, he deprives certain states of affairs and/or events of their deontic neutrality. Thus in our John example both r^{III}_{t+2} and r^{II}_{t+2} (2.1.1) are deontically neutral before John utters his promise (e.g. nobody would be sorry for his disappearance). That is what I meant by 'what is not forbidden in itself' in section 2.1.1. r^{IV}_{t+2} may also be deontically neutral then. Afterwards e.g. $O_t \neg r^{II}_{t+2}$ and $O_t \neg r^{III}_{t+2}$ and $O_t \neg r^{IV}_{t+2}$ obtain. John has reduced the set of deontically perfect worlds; worlds u such that $V(r_{t+2},u) = 1$ do not occur in it any longer. The risk that the real world will not be an element of it increases according as more states of affairs are deontically charged (i.e. non-neutral).

John has taken the risk and it turned out in fact that the world could not get the course that, thank to his promise, was needed in order to

(8) Where p means: John promises to see to it that q_{t+7}, and r: John visits his father.

make it deontically perfect from t on. But the risk, viz. that other things would not be equal, is normally not felt as unjustified in promising.

However, we feel that Jephta's promise was not warranted, for the risk that fulfilling it would demand killing a human being was too great. He reduced the set of best possible worldcourses to its subset in the worlds of which the one who meets him is not human and so not identical to his only daughter. This may be seen from the following formalization of Jephta's case. Jephta just has made his promise (p_{t-1}) and now $O_t(I_{t''}\, 1\overset{t'}{x} M_{t'}x)$ (9). But also $O_t \neg I_{t''}m$. So $O_t \neg(m = 1\overset{t'}{x} M_{t'}x)$.

Fortunately the definite description is not yet a rigid designator at $t-1$ (10): $\neg\Box_{t-1} m = 1\overset{t'}{x} M_{t'}x$. If it had been, Jephta had *created* a conflict of duties. But it turns out that $1\overset{t'}{x} M_{t'}x = m$. What ought to be done now at t″, this fact being a necessity? Here we have the conflict of duties. Because of the deontic counterpart of Th 12 of chapter II, $O_{t''}(I_{t''}1\overset{t'}{x} M_{t'}x)$ and $O_{t''}\neg I_{t''}m$ cannot both be true: we have $O_{t''}(I_{t''}1\overset{t'}{x} M_{t'}x) \equiv O_{t''} I_{t''}\, m$! See also chapter II, 2.3. From this moment on the worldcourse can no longer be perfect (seen from t), whatever Jephta's choice may be. His Q of section 1.1. and 1.2. nearly is getting overheated, because it has to put out a cue even now for this situation. The world has taken such a course that the agent must choose between two evils; he has to decide which of two incompatible alleged obligations is the strongest one.

In both John's and Jephta's case a prima facie duty was overruled by a stronger obligation. We may define the phrase 'An obligation $\phi_{t''}$ is overruled at time t′ by the stronger obligation $\psi_{t'''}$' as

$$(O_t\phi_{t''} \wedge \Box_{t'}(\phi_{t''} \supset \neg\psi_{t'''}) \wedge O_{t'}\psi_{t'''}), \text{ for } t < t' < t'', \text{ if not } \Box_{t'}\psi_{t'''} \text{ (11)}$$
(of course)

You get John's case if you substitute q_{t+7} for $\phi_{t''}$ and r for $\psi_{t'''}$, and Jephta's case by substituting $I_{t''}1\overset{t'}{x} M_{t'}x$ for $\phi_{t''}$ and $\neg I_{t''}m$ for $\psi_{t'''}$ or, resp. just the reverse if you prefer Jephta's Q (he did immolate his daughter).

(9) For convenience I fix the relevant dates. Let $I_{t''}m$ mean: Jephta immolates Mirjam at t″, and $M_{t'}x$: x meets Jephta at t′. Let $t < t' < t''$ and let Mirjam be the name of Jephta's daughter.

(10) See chapter II, 2.3.

(11) Note that $t' \leq t'''$.

In both stories a promise did not create – but gave rise to a conflict of duties: at the moment of the uttering of the promise its fulfilment was not forbidden. If it would have been true that e.g. $O_{t-1}\neg(I_{t''}\overset{t'}{x}M_{t'}x)$ resp. $O_{t-1}\neg q_{t+7}$ a conflict had been created. The only difference between John's and Jephta's example is that John's risk was acceptible ($P_{t-1}p_{t-1}$), whereas Jephta's was not ($\neg P_{t-1}p_{t-1}$).

2.2. *Other questions*

2.2.1. *Commitment and detachment. A solution of the dilemma*

> In chapter I, 2.1. we encountered what I called the dilemma of commitment and detachment. Traditional dyadic deontic logic cannot accept detachment, for a set like $\{p,(pOq), r,(rO\neg q)\}$ representing a possible situation is contradictory if it does accept detachment. On the other hand detachment should be possible, otherwise we cannot take such a conditional obligation seriously, because fulfilling the condition does not lead to an unconditional duty.

We pointed out that, as soon as p is the case, each of the notions of commitment $O(p \supset q)$, $(p \supset O q)$ and $(p O q)$ intuitively yielded the same conclusion for the moral agent: that q ought to be realized. So we got the rather embarrassing result that in this sense the formulas $(p \supset O q)$, $O(p \supset q)$ and $(p O q)$ are equivalent.

But now, after chapter II the surprise should have lost its poignancy. In II we reviewed formulas of the form $(\phi \supset \Box_6 \psi)$ and $\Box_y(\phi \supset \psi)$. Their difference in shape is misleading; it is essential only on a certain condition bearing upon a temporal relation between the time-indices involved. If that condition, viz. that the temporality of the antecedent reveals the same or a later point of time than the modal operator's temporality, is not met, the difference is without semantical import and therefore does not mean anything from a logical point of view. In other words, if the temporality of the antecedent is earlier than the modal operator's temporality, the formulas are equivalent. And exactly the same relation between the temporalities of the antecedent and the deontic operator makes the formulas $(p_t \supset O_{t'} q)$, $O_{t'}(p_t \supset q)$ and $(p_t O_{t'} q)$ equivalent, to wit $t < t'$, of the theorems

Th 16 $\models \forall y \forall y' (y < y' \supset (O_{y'} (\phi_y \supset \psi) \equiv (\phi_y \supset O_{y'} \psi)))$ and
Th 17 $\models \forall y \forall y' (y < y' \supset ((\phi_y O_{y'} \psi) \equiv (\phi_y \supset O_{y'} \psi)))$

This fits in with our analysis of the sentence (6) 'If (given that) John has impregnated Suzy he ought to marry her' as an 'absolute' commitment (see chapter I, 2.1.). In (6) the antecedent pertains to the past, the 'ought' to the present, seen from the time of utterance. So (6) is of the form $(\phi_t O_{t'} \psi)$ where $t < t'$. But this formula allows detachment, being equivalent to $(\phi_t \supset O_{t'} \psi)$ and so to $(\neg O_{t'} \psi \supset \neg \phi_t)$, the form of (6) 's equivalent (7) 'Only if John did not impregnate Suzy, it is not the case that he ought to marry her'.

Sentence (8), however, 'If John will impregnate Suzy, he ought to marry her' was analysed as a prima facie commitment. Here the antecedent does not lie in the past and consequently leaves room for other things being (not) equal. It's form is $(\phi_{t'} O_t \psi)$ where $t < t'$. But this formula is not equivalent to $(\phi_t \supset O_{t'} \psi)$ or $(\neg O_{t'} \psi \supset \neg \phi_t)$, neither does it allow detachment(12).

The difference between formulas expressing a prima facie- and an absolute commitment runs parallel to the difference between a prima facie- and an actual duty. A commitment has the form $(\phi_{t'} O_t \psi_{t''})$, where (usually) $t, t' < t''$ (13). It is a prima facie commitment if there is room for the 'ceteris paribus' proviso, i.e. if $t \leqslant t'$. Other things being equal $\phi_{t'}$ leads to the unconditional obligation to realize $\psi_{t''}$. Otherwise, i.e. if $t' < t$ there is no room; the commitment is 'absolute' (see also chapter I, 2.1.).

Now, seen from our system, the dilemma of commitment and detachment can be taken by the horns.

Let us go back to John's and Suzy's date. At t John promised Suzy (p_t) to have a cup of coffee with her at t+7 (q_{t+7}). Compare the consistent sets of propositions $\{p, O(p \supset q), \neg O q\}$ and $\{p, (p O q), \neg O q\}$ of chapter I, with our sets $\{p_t, O_{t+1}(p_t \supset q_{t+7}), \neg O_{t+1} q_{t+7}\}$ and $\{p_t, (p_t O_{t+1} q_{t+7}), \neg O_{t+1} q_{t+7}\}$ that are inconsistent (cf. Th 16 and 17). This is in accordance with our argumentation in chapter I, 1.1., and 2.1.. Here $P_{t+1} \neg q_{t+7}$ is not consistent with the fact that p_t commits to q_{t+7}, given p (i.e. at t+ 1, when p is already a fact, viz. a

(12) Note that we did not altogether exclude another interpretation of (8) as an absolute commitment nor an interpretation of (6) as a prima facie commitment.

(13) Sometimes, however, $t'' < t'$.

necessity). The sets $\{p_t, O_{t-1}(p_t \supset q_{t+7}), \neg O_{t-1}q_{t+7}\}$ and $\{p_t,(p_tO_{t-1}q_{t+7}), \neg O_{t-1}q_{t+7}\}$, on the contrary, are consistent. Here $P_{t-1}\neg q_{t+7}$ is consistent with the fact that p_t commits to q_{t+7}, because p is not yet 'given' at t−1 (the time the commitment pertains to); it is not yet a fact, nor is it a necessity. (If we replace the first occurrence of p_t by e.g. $\Box_{t-1}p_t$ the sets loose their consistency). But, although we cannot detach an unconditional duty from this prima facie commitment, we must take it seriously. If it turns out that $V(p_t,w) = 1$ together with $V(q_{t+7},w) = 0$, somewhere in the course of w from t−1 on something went wrong, and John may be called to account with a question like: 'How is it that $V(p_t \wedge \neg q_{t+7},w) = 0$?' And again he should defend himself pointing out in a way similar to that of section 2.1.1., that the other things were not equal([14]).

This is our answer to the (rhetorical) question in the first horn of the dilemma in I, 2.1.

The difficulty, made in the second horn, can be taken away as well. A set like $\{p_t,(p_tO_{t''}q), r_{t'},(r_{t'}O_{t'''}\neg q)\}$ need not be inconsistent.

For instance let $t'' = t''' < t',t$. As an example take

$$\{p_t,(p_tO_{t-1}q_{t+7}), r_{t+1},(r_{t+1}O_{t-1}\neg q_{t+7})\}$$

and read p and q as above and r as: John promises Anna not to see Suzy at t+7. Here we have a situation with conflicting (prima facie) commitments. John, asking himself at t−1 what he ought to do, knows that realizing both p_t and r_{t+1} is forbidden This would cause some defect, satisfying both commitments is impossible:
$\Box_{t-1}\neg(q_{t+7} \wedge \neg q_{t+7})$. Yet the set is no longer consistent if $t,t' < t'' = t'''$, for instance if we replace in our example t−1 by, say, t+3: one cannot have conflicting absolute commitments seen from the same point of time, if all the committing facts have been realized. ([15a])

It may be wondered what happens each time between t and t+7. Let us look what happens. John made the promise to Suzy and now, at t+1, the other things having remained equal: $(p_tO_tq_{t+7}),(p_tO_{t+1}q_{t+7})$, he has a prima facie duty to realize q_{t+7}. Furthermore, if still

([14]) Notice, that if other things do remain equal John gets an unconditional obligation.

([15a]) A cognate solution is to be found in Greenspan (13)

([15b]) 'Doing' r_{t+1} John would create a conflict of duties.

$(r_{t+1}O_{t+1}\neg q_{t+7})$, he can deduce $O_{t+1}\neg r_{t+1}$ because of $O_{t+1}q_{t+7}$ ([15b]). Nevertheless, he has yielded to Anna's tears at t+1 and John, still looking upon himself as a moral agent, now asks himself if $(r_{t+1}O_{t+2}\neg q_{t+7})$ is true as well, i.e. whether in the new situation at t+2 the other things have remained equal and the commitment to $\neg q_{t+7}$ in case of r_{t+1} still holds. Suppose the answer is affirmative. Then he has the unconditional duty $O_{t+2}\neg q_{t+7}$. Meanwhile he has the secondary obligation, say, to make an apology to Suzy (s) if he does not realize q_{t+7}: $(\neg q_{t+7}O_{t+2}s)$ etc., etc.

2.2.2. *Ought and Can*

We noted in chapter I, 2.2. that an ought-proposition is only a cue if it indicates a really possible direction, the essential point of a cue being to tell what choice we must make from still possible alternatives. In this sense the 'Ought implies Can' principle is valid in our system, see the requirement c. of section 1 which together with a. implies that Q has to pick out the (relatively) best world courses from the set of those worlds that are still accessible at a certain time.

Thus we not only have $\models \forall y(O_y\phi \supset \Diamond_y\phi)$, but even $\models \forall y(\Box_y\phi \supset O_y\phi)$ and $\models \forall y(\Box_y\phi \supset (\psi\, O_y\phi))$([16]): what is necessary at a certain time is 'part' of all (nearly) best possible worldcourses from that time on.

But we have also $\models \forall y\, \forall y'(y<y' \supset (\phi_y \equiv \Box_{y'}\phi_y))$ and consequently $\models \forall y\, \forall y'\ (y<y' \supset (\phi_y \supset (\psi\, O_{y'}\phi_y))$ and we can derive an Ought from an Is! This 'Ought', however, is not directive, it does not give direct cues for actions (see the end of section 2.1.1.), nor can it function as e.g. a posterior moral judgement (a statement of the form $O_t\phi_t$ expressed at a time $t'>t$). But it has consequences in the following way: you always have to consider the past as given, when you determine your cues. You cannot decide on what you primarily ought to do *now*, unless you start from the present situation([17]).

([16]) If you shrink from interpreting this theorem in terms of commitment you are right. See Hintikka's comment on the so-called paradoxes of commitment in chapter I, 1.1.

([17]) Your inheritance of the past, as it were. Cf. original sin.

So we have $\models \forall y \forall y'(y < y' \supset (O_{y'}\phi_y \vee O_{y'} \neg \phi_y))$.

In other words the past is deontically charged (non-neutral; see for the definition of this notion section 2.1.3.): for any D, any w∈W, any b

$$\text{if } D \models_{w} y < y'[b] \text{ then } D \not\models_{w} O_{y'}\phi_y[b] \Leftrightarrow D \models_{w} O_{y'} \neg\phi_v[b]$$

In fact as to the past all modal and deontic operators are dispensable, the corresponding distinctions collaps as is witnessed by the logical equivalences in the following 'valid' (pseudo-)formula:

$$\forall y \forall y'(y < y' \supset (\Box_{y'}\phi_y \equiv O_{y'}\phi_y \equiv \phi_y \equiv P_{y'}\phi_y \equiv \Diamond_{y'}\phi_y))$$

Incidentally this may throw a new light on Mally's axiomatic system([18]). It has been critised([19]) because $(0p \equiv p)$ is deducible in it and consequently his deontic logic is reducible to propositional logic. Now we see that the equivalence is not totally absurd; on certain conditions it does make sense. So does his axiom $((p \supset Oq) \equiv O(p \supset q))$. This, however, cannot be regarded as a rehabilitation of the system, of course. The fact that, in order to save some theorems, we need an interpretation in terms of 'faits accomplis', is enough to see that it is not useful for a moral agent.

Mally's first axiom $((p \supset Oq) \wedge (q \supset r)) \supset (p \supset Or)$ was criticized by Hintikka (see (18), p. 80). Hintikka says, that what makes the axiom plausible is the fact that r is a deontic consequence of $(p \supset Oq)$, $(q \supset r)$ and p. It embodies the mistake of '... formulating perfectly valid relations of deontic consequence as relations of logical consequence' (see (18), p. 80). We saw in I, 1.1., that the principle 'If the doing of A and B jointly necessitates the doing of C, then if we do A and are obliged to do B, we are obliged to do C.'
'If... interpreted as a logical consequence,... is a non sequitur...' according to Hintikka.

But this is not true. The principle may very well be interpreted as a logical consequence, you only need to read the second 'if' as 'as soon as': we get

$$\Box_{t'}((p_t \wedge q) \supset r) \supset ((p_t \wedge O_{t'}q) \supset O_{t'}r) \text{ for } t < t'$$

([18]) See Mally (25).
([19]) See e.g. Føllesdal and Hilpinen (11).

which is valid in our system.

In the same way we need not reformulate Mally's first axiom as a deontic consequence in order to get a valid principle. If we take $(q \supset r)$ as a mistaken formulation of 'r is a necessary condition of q' we may reformulate it as

$$((p \supset O_t q) \wedge \Box_t (q \supset r)) \supset (p \supset O_t r)$$

which is also valid[20]).

Notice, that in our system any (practically) necessary condition of what ought to be the case, ought to be the case as well:

$$\models \forall y(O_y\phi \supset (\Box_y(\phi \supset \psi) \supset O_y\psi))$$

2.3. *The paradoxes*

Let us see how our system deals with the Suzy Mae story including the paradoxes of chapter I, 3.2.

Using the Suzy Mae version of the Chisholm paradox, the problem was how we should formalize the sentences

1. it ought to be the case that John does not impregnate Suzy Mae;
2. it ought to be the case that, if John does not impregnate Suzy Mae, then he does not marry her;
3. if John impregnates Suzy, then it ought to be the case that he marries her;
4. John impregnates Suzy

so as to get a set of formulae that meets the requirements of consistency and non-redundancy and furthermore reveals on what interpretations the conditional obligation of 3.entails, jointly with 4., an unconditional duty.

Suppose John has an appointment with Suzy at t+7 and his parents are worrying now (at t) about John's behaviour then and there, and are talking about what John ought to do and refrain from. His mother (M) says: 'John should not get Suzy pregnant' (1). His father (F) adds: 'Yes, and he ought not to marry Suzy if he does not impregnate her' (2). M: "Why do you say 'if he does not impregnate her'? He ought

([20]) A non-temporal formulation would do as well.

not to marry her anyhow, he is a priest!'' F: 'Be realistic. If he impregnates Suzy, then he ought to marry her (3) and I am sure that (4) he will impregnate Suzy'.

Now the conversation becomes interesting, but let us stop for a moment and see how they may use our system.

Statement 1. may be interpreted a pertaining to all deontically perfect courses the world can take from t on: (1′) $O_t \neg p_{t+7}$; 2. in the same way: (2′) $O_t(\neg p_{t+7} \supset \neg q_{t+17})$. But 3. is different. Given (4′) p_{t+7} as the formalization of 4., (3°)$(P_{t+7} \supset O_t q_{t+17})$ renders {1′, 2′, 3°, 4′} inconsistent, and (3°°) $O_t(p_{t+7} \supset q_{t+17})$ would yield a redundant set. In fact 3°° is trivial, viewed in the light of 1′. It does not make sense to say: in all worldcourses that are perfect from t on in which p_{t+7} is true q_{t+17} is true, because worldcourses in which p_{t+7} is true are no perfect worldcourses at all. This is the very point of the Chisholm paradox; 3. expresses a secondary duty, being about non-perfect worldcourses in which the damage that will be done is neutralized as much as possible, and should be formalized as (3′) $(p_{1+7} O_t q_{t+17})$.

So we have $\{O_t \neg p_{t+7}, O_t(\neg p_{t+7} \supset \neg q_{t+17}), (p_{t+7} O_t q_{t+17}), p_{t+7}\}$.[21]

Let us go back to the conversation. M. Says: 'So you imply, in view of your statements 3. and 4. that John has the (unconditional) duty to marry Suzy Mae!' F: 'No, look at 3′. It is a prima facie commitment with a 'ceteris paribus' proviso: anything can happen between now (t) and t+7. You know how fond he is of Anna. Perhaps he will impregnate her in the meantime. That is why I did not say: *as soon as* John has impregnated Suzy he ought to marry her. That would be an absolute commitment, to be formalized as e.g. $(p_{t+7} O_{t+8} q_{t+17})$ which *does*, together with p_{t+7} imply an unconditional duty $O_{t+8} q_{t+17}$'. (M starts crying).

We know how the story continues. John impregnated Suzy Mae and now, because the other things remained equal (Anna was away on holiday), $(p_{t+7} O_{t+8} q_{t+17})$ and he ought to marry Suzy: $O_{t+8} q_{t+17}$. But after Anna returned he got her pregnant. Then he ought to marry Anna[22], not Suzy: $O_{t+10} \neg q_{t+17}$.

(21) For convenience I use arbitrarily fixed time indices here. Of course the Suzy Mae case is rendered best if we quantify over time-variables. For instance 3. is better approximated by $p_{t+7} 0_t \exists y'(y' < t+17 \wedge q_{y'})$, where t+17 is a terminus ante quem.

(22) Remember Anna was the more pitiful girl.

Fortunately his parents have one comfort: the language of QDTL offers a set of sentences that each time unambiguously tells them what John ought to do, just like the natural language set {1,..., 4, 'John impregnates Anna and now he ought not to marry Suzy'} (see chapter I, 3.2.,) may do.

In chapter I, 3.2. we saw that the Good Samaritan paradox resulted from the fact that the current systems have the rule: if $\models(\phi \supset \psi)$ then $\models(O\phi \supset O\psi)$; because John ought to marry an impregnated girl, there ought to be an impregnated girl. In our system we have such a rule too

if $\models(\phi \supset \psi)$ then $\models \forall y(O_y\phi \supset O_y\psi)$ or even $\models \forall y((\Box_y(\phi \supset \psi) \supset (O_y\phi \supset O_y\psi))$.

So in an analogous way, if we substitute for $\phi: \exists x(M_{t+17}jx \wedge I_{t+7}x)$ and for $\psi: \exists xI_{t+7}x$, we get for any time y
$\models\Box_y(\exists x(M_{t+17}jx \wedge I_{t+7}x) \supset \exists xI_{t+7}x)$ and so $\models(O_y\ \exists x(M_{t+17}jx \wedge I_{t+7}x) \supset O_y\ \exists xI_{t+7}x.)$

Now we have to substitute for y a moment of time t′ such that $t+7<t'$, in order to get (5) $O_{t'}\exists xI_{t+7}$ because John's obligation to marry an impregnated girl came into force only as soon as he had impregnated her.

At first sight it seems that this result is due to a wrong formalization of 'John ought to marry a girl he impregnated'; the sentence only tells John to marry the girl, not: to see to it that he has impregnated her. It clearly expresses the proposition that there is a girl, impregnated by John, he ought to marry. So we should formalize $\exists x(I_{t+7}x \wedge O_{t'}M_{t+17}jx)$.

This, however, will not help us. For, speaking on the rather plausible assumption that an individual can become pregnant only if it exists then, $\exists xI_{t+7}x$ is equivalent to $\exists^{t}\overset{t+7}{x}I_{t+7}x$ (23). And this immediately yields $O_{t'}\exists^{t}\overset{t+7}{x}I_{t+7}x$ (24), equivalent to (5) and we have the same result.

But by now it will be clear that (5) is not an ordinary ought-sentence. It does not make a choice out of several possibilities. No, it says that whatever world (best possible or not) will be realized $\exists xI_{t+7}x$ is true in it. It is equivalent to $O_{t'}\exists^{t}\overset{t+7}{x}I_{t+7}x$ which is of the form $O_{t'}\phi_t$, where $t<t'$ and so it is equivalent to $\Box_{t'}\exists^{t}\overset{t+7}{x}I_{t+7}x$ and to $\exists^{t}\overset{t+7}{x}I_{t+7}x$,

(23) See also chapter II, 2.3. Th 7 and note 7.
(24) Remember $t+7<t'$.

according to the equivalences expressed by the pseudo-formula in section 2.2.2. In one word, it does not mean that there ought to be an impregnated girl.

Thus we see that, although the equivalences seem to yield a Good Samaritan paradox that is even more serious than the one of the traditional systems (if a man has been robbed, he 'ought' to have been robbed)([25]), they offer a solution at the same time: the 'ought'-sentence does not provide a cue, the deontic operator does not play a role different from that of a trivial necessity-operator. It is utterly dispensable.

Perhaps you are not content with this solution, since it depends on a time-relation between propositions that is not essential for the paradox. Taking the hard version of the Suzy Mae story, for instance, in which John, hearing of Suzies condition, shoots her, we would get: because John ought to marry a girl he will kill, he ought to kill a girl.

Here the scope distinction does avoid the paradox. 'John ought to marry a girl he will kill' should be analyzed as $\exists x(O_{t+8}M_{t+17}jx \wedge K_{t+10}jx)$ and this does not imply that he ought to kill a girl. For that we have to wait until after t+10. Then we can get an 'ought' in a similar way. It will be a similarly innocuous 'ought', however.

3. *Conclusion*

We contended in our conclusion of chapter I, that all deficiencies of the traditional systems we had found would be overcome by a device, which we have now worked out in this chapter. We saw that our claim proved to be right.

A prima facie obligation has the form $O_t\phi_{t'}$ when other things remain equal, in other words 1. if it does not become impossible between t and t' to realize $\phi_{t'}$, i.e. if the set of deontically best world courses-from t on remains accessible until t' ([26]) and 2. if the obligation is not overruled by a stronger one, for in that case, although it may still be

([25]) Cf. also Mally's theorem $(p \supset Op)$ (See section 2.2.2.)

([26]) We use an 'inclusive' 'until' here.

possible to realize ϕ, nevertheless between t and t′ a set of best possible worlds that is different, and indeed disjoint, from the one related to t arises.

In the same way a commitment is transformed into an actual duty $((\psi_t O_{t'} \phi_{t''})$, where t, $t' < t''$, 'passes over into' $O_{t''} \phi_{t''})$, if until t'' (26) the 'ceteris paribus' proviso is fulfilled. Accordingly as $t' \leq t$ or $t' > t$ we have a prima facie- or an absolute commitment. Only the second one permits (together with ψ_t) a detachment resulting in an unconditional duty $O_{t'} \phi_{\tau''}$. This is the key to our solution of the dilemma of commitment and detachment.

Congenial is a situation in which a conditional secondary obligation is transformed into an unconditional one. Here we have, in the context of $O_{'t} \neg \psi_{t'}$, where $'t \leq t, (\psi_t O_{'t} \phi_{t''})$ for $t < t''$. Other things remain equal, so for some time $t' (t < t' \leq t'')$ $(\psi_t O_{t'} \phi_{t''})$ and, because of $\Box_{t'} \psi_t$ we have the unconditional $O_{t'} \phi_{t''}$.

The Jephta dilemma is characterized by the fact that Jephta's promise gave rise to a conflict of duties. Owing to his promise $O_{t'} \phi_{t'''}$ for some $t' < t'''$; but it turns out that $\Box_{t''} (\phi_{t'''} \supset \psi_{t'''})$ for some t'': $t' < t'' < t'''$. Yet we had $O_{t'} \neg \psi_{t'''}$. Only after he made his promise the conflict arose: at t''. He did not create a conflict of duty. This would have been the case if at the moment of his promise (say $t < t'$) fulfilling it $(\phi_{t'''})$ would already necessitate something forbidden, i.e. if $\Box_t (\phi_{t'''} \supset \psi_{t'''})$ and $O_t \neg \psi_{t'''}$.

We could formulate a principle of 'Ought implies Can' in terms of a notion of practical possibility. In QDTL $\models \forall y (O_y \phi \supset \Diamond_y \phi)$. But we have also $\models \forall y \forall y' (y < y' \supset (O_{y'} \phi_y \equiv \phi_y))$. However, in this formula, on account of the relation between the temporal indices, the 'ought' is not directive. It is equivalent to a trivial necessity and therefore dispensable.

And it is this harmless notion that is involved in the Good Samaritan paradox. That is why it lost its poignancy. Furthermore we offered a solution for the Chisholm paradox and the paradox of Suzy Mae, providing sets of propositions unambiguously formulating what ought to be done in the situations in question.

Thus we see that the system QDTL meets the requirements we stated in the course of chapter I for a deontic logic, that should satisfy the criterion of providing for a language rich enough to be able to function as a language of cues for the moral agent.

Why is QDTL so much more adequate than the traditional systems? Let us compare them. The traditional deontic logics are logics of general norms describing (nearly) deontically perfect worlds. But, as we noted in chapter I, in order to get cues for moral behaviour, one must not only look at these worlds, but decide as well whether following the highly prima facie cues suggested by them meets the demands of the special situations of our imperfect world. In order to take moral decisions we need an ethical point of view, producing cues telling us what we ought to do in this specific situation. We may regard our system QDTL as a logic of such an ethical point of view ([27]): the function Q each time offers sets of (nearly) best possible worldcourses in terms of which specific cues are interpreted. I think that if you want to characterize a person's morality you should look at 'his Q' ([28]): it seems much more interesting to me what $Q(w,\tau,X)$ someone creates again and again at each τ, than what is his set of (nearly) deontically perfect worlds. Even the dictator is in favour of democracy.

([27]) Of course deontic logic does not *supply* an ethical point of view.

([28]) You may be tempted to associate it with an 'inner voice'. Cf. the daimonion (hegemonikon (!)) of Socrates.

SOME DESIDERATA

We started our enquiry by criticizing the traditional systems of deontic logic for being seriously defective. Now we will finish by criticizing our own system as well, pointing out some desiderata which may help to repair *its* deficiencies.

1. *A subjective-accessibility requirement*

We must realize that not all formulas of the forms $\phi O_t\psi$ and $O_t\psi$ express commitments and obligations. In QDTL we cannot distinguish between them and their necessary conditions. Any formula $\phi\, O_t\psi$ implies formulas $\phi\, O_t\chi$ where χ is a necessary condition (at t) of ψ, and all necessary conditions of what ought to be the case, ought to be the case as well. But clearly, one cannot say that we have the obligation to realize all necessary conditions of our obligations: some of them lie completely beyond our control. Nevertheless, just because ought-sentences involving these conditions tell what happens in a (nearly) perfect worldcourse they function as cues that are of importance in cases in which one wants to decide whether to follow a course of action that gives rise to an obligation. For instance, if a promise commits us to, say, ψ, and it is unlikely that, or dubious whether some necessary condition χ of ψ will be realized, then the fact that the promise also commits to χ may warn us against making the promise. Take Jephta's case. A risky necessary condition of the conjunction of the obligation incurred by his promise to immolate that which would meet him on his return home $O_t(I_{t''}\imath xMx)$ and the obligation not to immolate a human, e.g. his daughter Mirjam $O_t \neg I_{t''}m$, is that Mirjam is not the one who will meet him; so (1) $O_t(\neg \imath xMx = m)$.

Let us turn our eyes now to Mirjam as a moral agent. She promised her mother at t to surprise her father and meet him as the first one at his arrival after such a long absence. But according to (1) she ought not to promise that, in the QDTL-sense of 'ought', because in this way she created a conflict of duties, just like e.g. John did when he promised to Anna not to fulfil his obligation to Suzy (see chapter III, section 2.2.1). However, we feel that whereas John is to be blamed for doing something forbidden, Mirjam is not. So we see that there is a difference between our judgment of Mirjam's behaviour and John's that is not accounted for by QDTL. And this is not the only discrepancy. From the point of view of QDTL it makes a crucial difference whether she made her promise before Jephta's promise (say at 't) or afterward (at t): if she had made her promise at 't she would not have created a conflict of duties (see (2): $\neg O_{'t}(\neg \imath xMx = m)$. But according to our feeling this difference is irrelevant; the moral status of her promise is independent of the question whether it was made before of after Jephta's promise.

The Mirjam-story makes clear that lack of knowledge plays a role in the choice of the set of best possible worlds. Sometimes you think that the set of accessible worlds at a moment contains a world while it does not, or vice versa. But you make different choices accordingly. As a result it may be that your set of best possible worlds is not the good one (you would have chosen another one if you had known the set of accessible worlds). So the outcome of a moral point of view is dependent on (real or putative) knowledge of the past of our world. A moral agent can only use a Q that picks out worlds which are in view of his knowledge still accessible. Sometimes he does not have sufficient relevant information to let the QDTL-Q work. In these case a more subjective 'ought' may diverge from the 'QDTL-ought', it is rather a question of guessing what is the best set than of deciding.

In short, after Jephta made his promise, Mirjam ought not to meet her father as he arrives ((3) $O_t \neg\phi$), in some sense of 'ought' (the QDTL-sense), because if she would, the course of the world from t on would not be perfect. But in another more subjective sense of 'ought' (3) is not true, (4) $O_t\phi$ is true. Now that she has made the promise to her mother she has the obligation to meet her father at his arrival: that is what happens in the best of those worlds that are accessible at t as far as she knows. So if she is blamed for realizing ϕ she will retort: 'The only thing you can require from me is to aim at the best subset of those worlds which I think to be accessible. Hence what I did do was something I *ought* to do!'

It is plain that QDTL does not account for this sense of 'ought'. In order to interpret these ought-sentences we need another interpretation of formulas $\phi O_t\psi$, as cues not telling something about the best alternatives out of those ϕ-worlds that are accessible at t simpliciter, but out of those worlds that are accessible at t as far as a moral agent knows. To get a semantics for this kind of 'ought' an adjustment is needed in the sense that Q fulfils a different accessibility-requirement, that is to say, one in terms of a subjective kind of accessibility, epistemic accessibility for a moral agent at a certain moment(1).

2. *Rational-decision conditions for Q*

However, not only the moral agents view of the past but also

(1) Notice that this 'ought' $0_t\phi$ can be 'ceteris paribus' in still another way: between t and the fulfilment of the obligation new information may change the agents view of the set of still accessible worldcourses.

anticipations of the future may play a role in forming cues. This is a serious point. Purtill pointed out that '... many obligations arise from an expectation that others will fail in their duties' (see (31)), thereby rejecting the whole idea of interpreting ought-sentences in terms of best possible worldcourses from a fixed moment on(²): of course these obligations cannot be interpreted in that manner!

For instance the man who has to reply to the question of the Nazi at the door (see chapter I, note 19) should, in order to get cues for moral action in this situation, not be guided by the set of perfect courses of the world from this moment on: (according to his Q) in all these worldcourses this Nazi (together with all his fellows) mends his way and he himself tells the truth. But he finds that he ought to lie, i.e. ought to deny that there are persons in hiding in his house. Apparently the set of worlds towards which he orients himself is a subset of the set of those probable courses of the world in which the Nazis proceed with their practices the next moment. Thus his directive is not interpreted in terms of perfect worldcourses. On the other hand it seems that on account of a possible worlds analysis of this 'ought' the Nazi 'ought' to continue with his practices (so he does in all probable worlds)!

An attempt to remove the anomaly by requiring that cues should be formed choosing the best possible worldcourses out of the accessible *probable* worlds is not good any way. Consider a situation in which you expect that someone will do his duty, but that, if he does not do it a disaster will follow, unless you tell a lie. Then in all best accessible probable worldcourses you do not take this action in order to avert the disaster. Yet your moral point of view forbids you to take any risk: you ought to tell the lie. It is plain that this cue is not the result of choosing the best alternatives out of the accessibles probable world-courses.

Up to now we talked about best possible worldcourses as worlds that are *perfect*, deontically most beautiful as it were, from a certain moment on. But as our last examples suggested these worlds are not always the ones we should aim at. Hence our feeling of an anomaly.

(²) Or, as he says, worlds up to a moment the same as ours in which from that moment on all relevant duties are fulfilled. See (27), p. 432.

They showed situations in which there is a discrepancy between

> cues delineating a set of perfect (most beautiful) worlds accessible at a moment (A), and
> cues pertaining to worlds that are ideal alternatives from a certain moment on in the sense that in them everyone acts in accordance with his responsibility in the given situation (B).

But using QDTL does not commit us to cues of the first kind (A). It all depends on how you understand 'best possible worldcourses'.

Following the last mentioned cues sometimes means hoping for the best but preparing for the worst.

That is what happens in our examples. As to the first one, in all worlds in Q(w,τ,W), understood as the set of B-alternatives in the situation, the man answers in the negative and the Nazi repents. Preparing for the worst means here: orienting towards those worlds in which the Nazi does not change. So he ought to tell a lie. But worlds in which he tells this lie and the Nazi mends his ways are still better than worlds in which he tells the lie and the Nazi does not mend his way. So the Nazi ought to repent (3). In the second example you find in this fashion that in all ideal alternatives the person in question fulfils his duty *and* you tell the lie. So you ought not to prepare for the best in spite of the fact that it is probable that he will fulfil his duty. You consider that if he will do his duty then, when you lie the world will be of a little less quality then when you don't. But if he will fail in his duty it makes a big difference whether you lie or not. If you do not, a moral disaster will follow.

It is by way of this kind of consideration that your Q decides what are the ideal alternatives in terms of which a directive is to be defined and thus which are the worlds you ought to aim at.

However, if we wish QDTL to be used in this manner, i.e. as a logic of cues defined in terms of the best alternatives in the above sense, rather than of deontically most beautiful worlds, it is desirable that the formal structure of the procedures of decision involved meets up

(3) Thus obligations arising from an expectation that others will fail in their duties can after all be interpreted in terms of worlds in which from a certain moment on 'all relevant duties are fulfilled' (cf. note 2).

rational-decision conditions, to be incorporated as requirements a Q-function, deciding which worlds are the best alternatives, has to satisfy.

Concluding we may say that the desiderata expounded in this chapter point out that QDTL as sketched here is not the final system of a temporally relative 'ought'. It is only a beginning.

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