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Notes on Early Chinese Logic (VI)

VII. The principle of double negation, the law of contradiction and some related problems in early Chinese thought (*Continued*). — As has been shown in the preceding section, the *Han Fei tsï* story about the weapon-dealer involves a conjunction of self-contradictory propositions, a conjunction which was explicitly rejected by the compiler of the text (see RO XXIX, 2, pp. 136—138). Thus, the story can rightly be considered, first, a good illustration (and one fairly sophisticated at that) of what contradiction is, second, a specific formulation of the principle of non-contradiction. It has also been remarked that none of the factors constituting the conjunctional formula involved in the story, $*[\underset{x \varepsilon A\, y}{\Sigma}\, \Pi(xR_1y)] \cdot [\underset{y \varepsilon B\, x}{\Sigma}\, \Pi(xR_1y)']$, is a direct negation of the other, nor can be directly transformed in such a way as to yield the negation of the other factor (see ibid. p. 138). It follows that the self-contradictory conjunction we have been dealing with is not a case corresponding to the simple formula of propositional contradiction, $*(p \cdot p')$, but one corresponding to the formula of indirect contradiction, $*[p \cdot q \cdot (q \supset p')]$. It remains to be shown that the second factor of the conjunction — although neither constituting a direct negation of the first nor being equivalent to such a negation — actually implies the negation of the first factor.

Now, the second factor of the given conjunction, containing the restricted existential operator as it does, evidently implies the unrestricted formula $\underset{y\ x}{\Sigma\Pi}(xR_1y)'$, since if anything holds good for some specified y, it necessarily holds good for some y without further specification (but not vice versa). In other words: any y which happens to be B is, after all, s o m e y. That is to say:

$$(1) \qquad \underset{y \varepsilon B\, x}{\Sigma}\, \Pi(xR_1y)' \supset \underset{y\ x}{\Sigma\Pi}(xR_1y)'$$

According to the rules for the order of operators, the implicate of formula (1) itself implies the corresponding expression in which the order of quantifiers has been reversed (but not vice versa):

$$(2) \qquad \underset{y\ x}{\Sigma\Pi}(xR_1y)' \supset \underset{x\ y}{\Pi\Sigma}(xR_1y)'$$

The fully unrestricted implicate of this latter formula implies, in turn, the partly

restricted expression $\underset{x \varepsilon A\, y}{\Pi}\, \Sigma(xR_1y)'$, since if anything holds good for a l l x, it necessarily holds good for all such x which happen to be A (but not vice versa)[1]:

$$(3) \qquad \underset{x\ y}{\Pi\Sigma}(xR_1y)' \supset \underset{x \varepsilon A\, y}{\Pi}\, \Sigma(xR_1y)'$$

Making use of the law of transitivity of the implication, we easily obtain from (1), (2) and (3) the formula:

$$(4) \qquad \underset{y \varepsilon B\, x}{\Sigma}\, \Pi(xR_1y)' \supset \underset{x \varepsilon A\, y}{\Pi}\, \Sigma(xR_1y)'$$

the implicate of which — according to D e M o r g a n' s rules so often resorted to previously — yields the equivalence:

$$(5) \qquad \underset{x \varepsilon A\, y}{\Pi}\, \Sigma(xR_1y)' \equiv [\underset{x \varepsilon A\, y}{\Sigma}\, \Pi(xR_1y)]'$$

Consequently, by simple substitution of equivalent terms we obtain from (4) and (5)

$$(6) \qquad \underset{y \varepsilon B\, x}{\Sigma}\, \Pi(xR_1y)' \supset [\underset{x \varepsilon A\, y}{\Sigma}\, \Pi(xR_1y)]'$$

Thus, we have shown that the second factor of our conjunction, $\underset{y \varepsilon B\, x}{\Sigma}\, \Pi(xR_1y)'$, corresponding to "there are some shields which nothing can pierce", — although neither constituting a direct negation of the first factor, $\underset{x \varepsilon A\, y}{\Sigma}\, \Pi(xR_1y)$, that is, "there are some spears which pierce everything",[2] nor being equivalent to such a negation — actually implies the negation of the first factor. This is precisely what is meant by the statement that the kind of contradiction involved in the *Han Fei tsï* story is not one corresponding to the formula of direct propositional contradiction, $*(p \cdot p')$, but one corresponding to the formula of indirect contradiction, $*[p \cdot q \cdot (q \supset p')]$. Consequently, the explicit rejection of the conjunction is a specific relational counterpart of the law of non-contradiction in its rather sophisticated formulation $[p \cdot q \cdot (q \supset p')]'$, cf. RO XXIX, 2, p. 134.[3] Clearly, the minds of those who — 'dialectical' as they might be — were able to construct (and in relational terms at that)

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[1] The reader will note that we are using here (as well as in the first step of the present demonstration) self-evident rules specifically similar to those already made use of in the previous analysis by substitution, cf. RO XXIX, 2, p. 138, footnote 32. One however must be warned against invalid implication in the other direction, for instance, that if anything holds good for all such x which are specified in some way, it also holds for all (unspecified) x. Both (1) and (3) are cases of one-way implication, not of equivalence. Similarly with (2), although for a different reason.

[2] As we know (cf. RO XXIX, 2, p. 137), the order of the statements as they stand in the story has been reversed in our conjunctional formula for the sake of both convenience and 'logical elegance'. This reversal of order has, of course, no bearing on the validity of our analysis.

[3] The fact that the principle of non-contradiction involved in the *Han Fei tsï* story actually corresponds to $[p \cdot q \cdot (q \supset p')]'$ — not to the formula of direct contradiction — deserves emphasis in view of the subsequent discussion of the laws of non-contradiction and excluded middle in the Mohist dialectics. Logically, the formula $[p \cdot q \cdot (q \supset p')]'$ differs from $(p \cdot p')'$ in that both p and q may be false

a case of indirect contradiction and condemn it as notoriously false must *a fortiori* have rejected any case of direct contradiction consisting of a conjunction of propositions differing by mere negation. Contradiction must have been considered by them as falsehood *par excellence*, and there even appears to be among the Chinese thinkers (especially in the *Han Fei tsï* itself) some overemphasis on the 'fallacy of contradiction' (矛楯之說) in the sense that this latter term was sometimes used as a catchword for standpoints considered wrong (even if not necessarily involving logical contradiction).[4] Without entering into particulars, we shall notice that such an overemphasis, if any, on the law of (non-)contradiction (in the sense of the application of the term 'fallacy of contradiction' to cases which are false, or considered false, but which are not those of real contradiction) cannot have any bearing on the recognition of the law itself, so clearly stated in our text. On the contrary, such cases would suggest that the philosopher was aware of the fact that contradiction conceived as the most flagrant example of falsehood is, after all, equivalent to any falsehood.

Explicit references to (non-)contradiction made by the Mohist dialecticians and preserved in the 'canonical' chapters (40—43) of the *Mo-tsï* are of a still greater importance, since they, first, are put forward in connection with the practice of dialectic discussion; second, they are concerned with direct contradiction, $*(p \cdot p')$; and consequently, third, they necessarily involve the problem of excluded middle. All these points are entirely absent from the *Han Feï tsi* story just discussed, and this is perhaps one of the reasons why the story itself has escaped the notice of nearly all historians of Chinese thought, including those pretending to deal with Chinese logic. The Mohist aspect of our problem has, on the contrary, been discussed rather frequently by sinologists, even if not always in adequate terms.

H u S h ï appears to be the first modern scholar who realised some fifty years ago that for the Mohist dialecticians "the principle of contradiction [non-contradiction] was the canon of argumentation" (*Development*, p. 141),[5] and H. M a s p e r o did not fail to make a similar statement (*Notes sur la logique de Mo-tseu...*, pp. 36—37).

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without violating the law of excluded middle, while p and p' cannot both be false. As we shall see later, the Mohists deliberately confined their 'dialectical discrimination' to cases of direct contradiction, $(p \cdot p')'$, in which the contestants not only cannot both be right (law of non-contradiction), but also cannot both be wrong (law of excluded middle).

[4] It would be useful to examine from this point of view the two contexts (and especially the second) in which the story about the weapon-dealer appears in the *Han Fei tsï*. Cf. also the translation by W. K. L i a o, *The Complete Works of Han Fei Tzŭ*, vol. II, 1959, pp. 142—143 and 203—204. By the way, I think that in the second case L i a o unnecessarily accepted W u K u a n g - t s' ê' s emendation of the *textus receptus*, since it is precisely this emendation which eliminates any trace of contradiction from the context.

[5] By the way, H u S h ï was much less explicit on this point in the Chinese version of his book, in which one can hardly find such a clear conclusion of his analysis of the Mohist logic.

But curiously enough, neither Hu Shï nor Maspero noticed that the law of excluded middle was equally present in the Mohist dialectics. In Western sinology, the first statement that the Mohists "recognise the principle of the excluded middle in practice if not in theory" is due to A. C. Graham[6] who — inversely — left out of consideration the law of non-contradiction. As a matter of fact, both these laws, complementary as they are in classical two-valued logic, are rather explicitly stated in the Mohist 'Canons', — and this point, to my knowledge, has so far been put forward only by Chan Kien-feng.[7] Before proceeding to a formalised account of the problem as it stands in the Mohist fragments, it is useful to say a few words, first, on the Taoist standpoint in relation to logic; and second, on an early Chinese doctrine (or rather quasi-doctrine) to which, as Chan Kien-feng points out, the Mohist dialecticians must have been in direct opposition, and which they opposed precisely by means of the principles of non-contradiction and of excluded middle. Third, these principles themselves must be briefly discussed.

Now, what has so far been said in the present chapter does not mean that absolutely all early Chinese thinkers adhered to the fundamental principles of ordinary logic and that there were no people of intellectual standing in early China who for various reasons had placed themselves outside that stream of mental activity with which we are concerned here. First, there were the Taoists with their specific metaphysically-dialectical conception of Nature — which conception, however, is by no means the same as any 'dialectical logic'[8] — who preached (mostly in obscure terms) dissolution of contraries in *tao*, irrelevance of notional differentiations, lack of objective criteria of truth and falsehood, relativism, etc., and who — rather consistently with their transcendent viewpoint on the phenomenal world — simply disregarded logic as concerned with processes of reasoning.[9] This, of course, is different from a straightforward rejection of the logical principle of non-contradiction (or of any other logical

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[6] *"Being" in Western Philosophy compared with shih/fei and yu/wu in Chinese Philosophy*, "Asia Major", VII, 1—2, 1959, pp. 79—112. The article is also a contribution to the interpretation of the Mohist 'canonical' chapters, see especially pp. 91—96.

[7] *Mo-kia-ti hing-shï lo-tsi*, Wuhan 1957 (referred to previously, RO XXVI, 1, p. 104), pp. 24—26. This is the best (although non-formalised) account of the given problem together with its historical background. For the sake of comparison, it is worth while to recall that in the *Comprehensive History of Chinese Thought* by Hou Wai-lu (and others, cf. the previous reference in RO XXIX, 2, p. 136, footnote 28), which — unlike other works of this kind — gives much attention to the law of non-contradiction in Chinese philosophy (this law itself is traced back to Confucius), there is practically nothing on the problem of non-contradiction in the Mohist fragments, while the problem of excluded middle has been entirely omitted from the book.

[8] I am glad to find the simple but important idea that a dialectical conception of Nature is not the same as 'dialectical logic' in a recent paper by D. Leslie, *Argument by Contradiction in Pre-Buddhist Chinese Reasoning* (Occasional Paper 4, The Australian National University), Canberra 1964, pp. 3—8.

[9] These are the 'logical' points which can be seen, for instance, in the *Ts'i wu lun*

law) in order to put forward anything like a new system of patterns of reasoning. As a matter of fact, that which with regard to our problem can be sufficiently substantiated by Taoist texts is the emphasis on the uselessness of logical argument and of dialectic discussion in view of the 'supertruth of the *tao*' as unattainable through discoursive thinking rather than any new (and 'better') Taoist kind of logic. It goes without saying that such a transcendent and in a sense nihilistic viewpoint on logical argument constituted a challenge to the logically-minded Mohist rationalists, and it is possible that some of the (rather obscure) Mohist fragments are to be conceived as a response to Taoist claims (cf. Graham, *"Being"...*, pp. 95—96). But what the Mohists must have been directly opposed to for both logical and ethical reasons is another kind of 'logical nihilism', which socially and ethically was more dangerous than that of the Taoists, since it had a much less honest origin and purpose. There is sufficient evidence to the effect that there were in pre-Han China adherents of the *liang k'o chï shuo* 兩可之說, that is, of the 'theory that both (contradictories) are admissible', and that, in fact, they were ready to put forward or defend whatever thesis they liked to have prevail at the moment. The Chinese tradition has connected the origin of the *liang k'o* theory and practice with the name of Teng Si, a 'lawyer' who lived in the 6th century B.C.[10] *Lie-tsï* VI, 4 (beginning) says: 鄧析操兩可之說，設無窮之辭 "Teng Si adhered to the theory of 'both are admissible', and put forward endless arguments".[11] *Lü-shï Ch'un-ts'iu* XVIII, 4 is more explicit when it says that Teng Si made much disorder in the state of Cheng because of 以非爲是，以是爲非，是非無度而可與不可日[因]變 "taking the wrong for the right and the right for the wrong, so that the right and the wrong had no fixed limit, and the admissible and the inadmissible changed from day to day" (according to another reading: "changed in accordance (with Teng Si's wishes)").[12] The same text also says that Teng

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chapter of the *Chuang-tsï* together with Kuo Hiang's commentary on it. By the way, I think that it is high time to put an end to the entirely wrong opinion going back to Hu Shï, which considers the Taoist texts like *Lao-tsï* and *Chuang-tsï* as concerned with a logical theory. On the other hand, what there actually is of implicit logic in the early Taoist writers, can safely be expressed in terms of 'ordinary' logic, cf. the chain-reasoning in *Lao-tsï* previously analysed, RO XXVI, 2, pp. 91 ff.

[10] The extant treatise entitled *Teng Si tsï* is a late forgery, cf. RO XXVI, 1, p. 18, footnote 3. A few data scattered through various early texts are the only source-material on historical Teng Si and his activity.

[11] The translations of this passage by Bodde ("Teng Hsi maintained theories that were open to opposite interpretations, and instituted endless verbiage (in debate)", Fung-Bodde, *Hist. of Chin. Philosophy* II, p. 193) and Graham ("Teng Hsi maintained ambiguous assertions and never ran out of arguments to support them", *The Book of Lieh-tzŭ*, 1960, p. 127) appear to miss the point; cf. also Chan Kien-feng, op. cit., p. 24.

[12] For the Chinese text see Hü Wei-yü, *Lü-shï Ch'un-ts'iu tsï-kie*, 1955, vol. II, p. 838; for the translation cf. R. Wilhelm, *Frühling und Herbst des Lü Bu We*, 1926, p. 302.

S i successfully used his skill in lawsuits, making people gain or lose at his will, and that there were innumerable people who offered him pieces of clothing (which he demanded as reward for his legal aid) in order to obtain instructions from him. All this ended badly for T e n g S i, since in view of the ensuing disorder he was finally put to death. Only then could order be restored and, says our text, 是非乃定 "the right and the wrong became fixed". In spite of the specific ethical-legal connotation of the terms *shï* 是 'this; is-this' and *fei* 非 'is-not' which is emphasised in the present context (connotation corresponding to that of the English terms 'right' and 'wrong' we have used to render the Chinese terms), there can be no doubt that, in fact, *shï* and *fei* also had the logical connotation of 'true' and 'false' (or: 'affirming as true' and 'rejecting as false'), and that the various connotations (and functions) of *shï* and *fei* have not been clearly differentiated by the Chinese. On the contrary, *shï* and *fei* were mostly used as pregnant for everything they could express more specifically, that is, positive assertion of what was considered true (largely the same as stating the logical value 'true') together with approval of what was considered morally right on the one hand, and negation, rejection of what was considered false (stating the logical value 'false') together with disapproval of what was considered wrong on the other.[13] The same is true of the present context, and it can safely be assumed that what the *Lü-shï Ch'un-ts'iu* has in view is not only that T e n g S i consciously confounded the legally right and the legally wrong, but also that he deliberately disregarded the distinction between the 'is' and the 'is-not' of his statements and, consequently, took no care of truth or falsehood. Fortunately enough, this is confirmed by the *Sün-tsï* in which T e n g S i is mentioned several times, mostly in connection with the well-known sophist of the 4th century B.C., H u e i S h ï. One *Sün-tsï* passage (*Harvard-Yenching Concordance* 21/8/28) explicitly says that both T e n g S i and H u e i S h ï 不邮是非然不然之情 "did not care about the spirit of (the distinction between) the right and the wrong, the 'is so' and the 'is not so'",[14] — and here the terms *jan* 然 'it is so' and *pu jan* 不然 'it is not so' leave no doubt that not only value-judgments but also positive

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[13] Cf. also G r a h a m, *"Being"...*, p. 90. By the way, the semantic and functional ambiguity of *shï* and *fei* forms part of the major problem of ambiguity in Chinese, which ambiguity appears to constitute one of the most important factors hindering the development of explicit logic. Cf. my paper *Język starochiński jako narzędzie rozumowania* [= *Early Chinese as a Tool of Reasoning*, in Polish], "Sprawozdania z prac naukowych Wydziału Nauk Społecznych Polskiej Akademii Nauk" VII, 1964, fasc. 2 (33), pp. 108—133. On the other hand, the polarisation of *shï* and *fei*, so strongly emphasised in Chinese philosophical texts, itself points to the principle of bivalence as underlying the logical thinking of the Chinese. For a specific use of *shï* and *fei* as quasi-variables roughly corresponding to our p and p' or $\varphi\hat{x}$ and $\varphi'\hat{x}$, cf. infra, p. 43.

[14] For the translation cf. H. D u b s, *The Works of Hsüntze*, p. 97. But the footnote qualifying T e n g S i and H u e i S h ï as leaders of the Mohist dialecticians is a gross mistake.

and negative assertions about the same of the form p vs. p' (or better: $\varphi\hat{x}$ vs. $\varphi'\hat{x}$) are concerned.[15] There can also be no doubt that such a complete disregard of the logical value of one's own statements together with the readiness to put forward and support any thesis suitable for the moment even if contradictory with that previously defended, largely amounts not only to the rejection of the criteria of truth and falsehood but also to the rejection of the principle of non-contradiction, at least in practice if not in theory. A word must also be added on the important difference between Teng Si's standpoint and that of the Taoists. As can be seen from the foregoing remarks, this difference is twofold: first, unlike the Taoists, Teng Si did not preach the uselessness of discoursive thinking and argumentation, but, on the contrary, "put forward endless arguments" in support of anything he liked to impose on others; second, unlike the Taoists, he did not disregard the logical criteria and principles in view of the metaphysical 'supertruth of the *tao*' in which contraries and contradictories of the phenomenal world were deemed to disappear, but consciously rejected all such principles for anything but metaphysical reasons, namely, in order to bring confusion on the minds and to fish in waters he himself had troubled. This is at least what extant sources suggest or explicitly say of him,[16] and it goes without saying that such a standpoint must have been considered specially dangerous by the Mohists whose logical and dialectical interests were linked with a positive ethical theory. Thus, it appears highly probable that it was precisely in response to the peculiar *liang k'o* theory put forward by Teng Si and followed by others in his wake — a theory which could not be opposed with intuitive means — that the Mohists undertook a search for explicit criteria of 'dialectical discrimination', which, in turn, led them to the formulation of the principles of non-contradiction and of excluded middle. This is also confirmed by the Mohist terminology itself, since, as we shall see, one of the most important 'canons' is verbally reminiscent of the *liang k'o* theory.

Furthermore, proceeding to the analysis of our problem as it stands in the 'canonical' chapters of the Mohists (the two *King* and the two *King-shuo*, that is, chapters 40—43 of the *Mo-tsï*), it appears necessary to start with the remark that some confusion is likely to arise about the principles of (non-)contradiction and of excluded middle even in the minds of intellectual standing if these are not specifically trained in formal logic. I mean the fact that the two principles are not always clearly kept apart in ordinary thinking, and that a clear-cut distinction of the two is not so easy

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[15] As a matter of fact, *jan* and *pu jan* are to be conceived in this context as quasi-variables corresponding to our p and p', that is, propositions differing by mere negation.

[16] For the present account cf. also Hou Wai-lu, *Chung-kuo sï-siang t'ung-shï* I, pp. 342-343, where however Teng Si's position is discussed only in connection with Huei Shï's doctrine. To my knowledge, the first author who emphasised the (negative) connection between Teng Si's *liang k'o* practice and the Mohist dialectics is Chan Kien-feng, op. cit.

to make as it might appear. Now, what is stated by the formula of (non-)contradiction, $(p \cdot p')'$, is only that any conjunction of two self-contradictory statements is false, that is, that we are not allowed to assert (or accept) any such conjunction; but this formula does n o t state that one of the propositions concerned is true. The falsity of the given logical product which is stated by the formula implies that a t l e a s t one of the factors is false, but it does not exclude that both factors might be false: "*0.1 = 0*" and "*1.0 = 0*", but also "*0.0 = 0*".[17] On the other hand, the law of excluded middle, corresponding to the formula $(p \vee p')$ in which " $\vee$" is the sign of non-exclusive alternative (logical sum) and is sometimes rendered in English as "and/or", only states that any logical sum of two propositions standing in direct contradiction to each other (differing by mere negation) is true, but it does n o t state that one of the propositions concerned is false. The truth of the whole alternative which is stated by the formula $(p \vee p')$ implies that a t l e a s t one of the two propositions concerned is true, but it does not exclude that both might be true: "$0 \vee 1 = 1$" and "$1 \vee 0 = 1$", but also "$1 \vee 1 = 1$".[18] If we are inclined to think that of two contradictory propositions o n l y one is true and o n l y one is false (even if we happen not to know which is which), it is not because we make use of the principle of non-contradiction (which by itself does not exclude that both such propositions might be false), nor because we make use of the principle of excluded middle (which does not exclude that both such propositions might be true), — but because we make intuitive use of the conjunction of both these principles. As a matter of fact, it is only the conjunction of the two laws, $[(p \cdot p')' \cdot (p \vee p')]$, which excludes that both p and p' might be true (because of contradiction) and that both might be false (because of excluded middle), or, in other words, states that of two

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[17] As a matter of fact, both factors may be false in the case of indirect contradiction, that is, a conjunction $p \cdot q$ in which p is such as to imply q' (or q is such as to imply p'), cf. the *Han Fei tsï* story as analysed supra, pp. 31—32. We are by no means allowed to infer from the story and its logical analysis that only one of the statements put forward by the weapon-dealer was false but the other true (even if we do not know which one was false and which true). It seems evident that both must have been false, and this is in perfect agreement with the falsity of the conjunction.

[18] It can easily be seen that both propositions of which a logical sum is composed may be true in the case of $(p \vee q)$ in which p is such as to imply q, for instance: "This is a puppy (p) or this is a dog (q)". It is clear that the "This" spoken of in such an alternative connection may (1) happen to be both, — and it is both if it is a puppy, since "This is a puppy" implies "This is a dog". On the other hand, (2) it may happen that only the second proposition is true, since "This is a dog" does not imply "This is a puppy". In both such cases, (1) and (2), our alternative (logical sum) remains true; but it becomes false if (3) neither of the component propositions is true, for instance, if the "This" spoken of actually is an ox. The present exemplification follows that given by the Mohists themselves, although, as we shall see later, their own reasoning can be best interpreted within the calculus of functions, cf. infra, pp. 42—45.

propositions differing by mere negation exactly one is true and one is false. Now, this conjunction of the two laws may be given equivalent simpler form by means of *exclusive disjunction*, which is rarely resorted to in mathematical logic but is logically as good as any other operation commonly used. Exclusive disjunction also has wide currency in ordinary language in the form "either... or...", even if this latter construction is not always clearly distinguished from that with the non-exclusive "or". Logically, the disjunctive structure "either p or q" is true if one (only one) of the two propositions involved is true and one (only one) is false; on the other hand, the whole structure becomes false if both propositional components are false, but also if both of them are true. Insisting on such a function of "either... or..." and symbolising this linguistic expression by "$\underline{\vee}$", we can write the conjunction of the laws of non-contradiction and of excluded middle in the form: $(p \mathbin{\underline{\vee}} p')$, that is, "either p or p'".[19] It appears that it is precisely this form which is most commonly resorted to (even if intuitively) in ordinary thinking. Of course, there is no evil in such a blending of the two fundamental logical laws into one, a blending which justifies itself both linguistically and logically at least for those who stand on the ground of classical two-valued logic (the tautology $(p \mathbin{\underline{\vee}} p')$ would be inacceptable for the Intuitionists precisely because of the law of excluded middle involved in it). But, on the other hand, it appears that this blending easily leads to a confusion of (non-)contradiction and excluded middle and sometimes (even at the philosophical level) does not allow us to see clearly the specific difference of the two principles. The conclusion of the present discussion is that we are allowed to use freely the formula "either p or not-p" as a logical tautology of prime importance (provided, of course, that we do not have intuitionistic inclinations), but we must remember that this formula is, in fact, the conjunction of the principles of non-contradiction and of excluded middle, and we must be able to differentiate clearly the two factors, $(p \cdot p')'$ and $(p \vee p')$, actually hidden in our apparently non-conjunctional formula.

The foregoing somewhat pedantic introduction to the analysis of the Chinese fragments has been necessary not only because most of the preceding remarks will prove to be useful to the analysis itself, but also in order to give an idea of the kind of difficulties the Mohists had to struggle with in their endeavours to formulate the principle of non-contradiction and that of excluded middle. This latter must have constituted a special difficulty for them, since, an we know, the Chinese had

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[19] It can easily be seen from the matrices for the operations involved that the conjunction $[(p \cdot p')' \cdot (p \vee p')]$ actually is equivalent to $(p \mathbin{\underline{\vee}} p')$. The matrix for $(p \cdot q)'$ — which formula is false only if both p and q are true — is *"0111"*, and that for $(p \vee q)$ — false only if both p and q are false — is *"1110"*. The matrix for the conjunction $[(p \cdot q)' \cdot (p \vee q)]$, in which the matrices for $(p \cdot q)'$ and $(p \vee q)$ must agree in truth, is *"0110"*. Now, the matrix for $(p \mathbin{\underline{\vee}} q)$ — which formula is true only if o n e of the propositional components is true — is exactly *"0110"*. It follows that $[(p \cdot q)' \cdot (p \vee q)]$ is equivalent to $(p \mathbin{\underline{\vee}} q)$, and consequently, by substitution p'/q, that $[(p \cdot p')' \cdot (p \vee p')] \equiv (p \mathbin{\underline{\vee}} p')$.

no fully adequate linguistic means to express either the logical sum (non-exclusive alternative) or the exclusive disjunction (cf. RO XXVI, 2, p. 104). Consequently, the Mohists must have devised some indirect way to express what they meant, and fortunately enough, they did it in rather clear terms.

As is known, the 'dialectical' chapters of the *Mo-tsï* — and especially the 'canonical' ones with which we shall be concerned[20] — belong to the most corrupted pre-Han texts we have, and presumably it was their original obscurity which facilitated the corruption. They have been emended, re-arranged and interpreted in various and sometimes very divergent ways by many scholars since P i Y ü a n, the first modern editor of the *Mo-tsï* (late 18th century). In these circumstances it should be specially emphasised that the differences in emendation and interpretation only minimally affect the fragments involved in the following analysis, and that the fragments themselves belong to the clearest ones in the chapters they form part of. In particular, it is precisely in the case of the fragments with which we shall be concerned that only few emendations are necessary, and only such as are accepted by nearly all scholars since S u n I - j a n g. As a matter of fact, the Chinese text of the entries I shall make use of is substantially the same as that in S u n' s *Mo-tsï hien-ku*. Second, the differences in interpretation (or misinterpretation) of the fragments concerned can be largely disregarded, since most of them are due to philological speculations without a sufficient logical basis. Third, the problem of the classification of the entries in such a way as to combine those of the *King* chapters with the corresponding 'explanations' of the *King-shuo* chapters — which is rather delicate with regard to the whole of the *textus receptus* — is not relevant in our case and can be disregarded; by the way, the connections between the entries here in question are sufficiently clear to justify in this particular case the arrangement on which most Chinese scholars are in agreement. All this, of course, does not mean that I did not take into consideration the various editions of the chapters and various special studies on the subject, Chinese and Western, at least all I could have access to. As has already been said, I feel particularly indebted to C h a n K i e n - f e n g for the interpretation, to G r a h a m' s *"Being"* for valuable suggestions concerning the English translation of some items, and incidentally to others, although it has not been possible to acknowledge my indebtedness in each particular case.[21]

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[20] All fragments concerning our problem are scattered through the *King* and *King-shuo* chapters (40—43), to the exclusion of the *Ta-ts'ü* (44) and the *Siao-ts'ü* (45).

[21] To facilitate the identification of the entries discussed (and also the comparison of various interpretations put forward by the Chinese investigators of the Mohist dialectics), a complicated system of references is unavoidable. Thus, every entry is marked as Ks (*King shang*, 40), Kh (*King hia*, 41), Kss (*King-shuo shang*, 42), or Ksh (*King-shuo hia*, 43); these letters are directly followed by the number the given entry has in T'a n K i e - f u' s *Mo-pien fa-wei*, 1958. The letters in parentheses refer to other important and most recent publications on the subject, namely: K = K a o H e n g, *Mo-king kiao-ts'üan*, 1958; W = W a n g T i e n - k i, *Chung-*

As has already been mentioned, the Mohist fragments concerning the principle of non-contradiction and of excluded middle are centered around the problem of the validity of the dialectical discussion, which latter the Mohists call 'discrimination', *pien* 辯. Their first point is that a valid discrimination must bring victory to one of the opponents and, inversely, that the discrimination is invalid if there is no victory in it. Ks 74 (K 75, W 74, L 92) reads: 辯，爭彼也；辯勝，當也 "Discrimination is contesting the *That*; if there is victory in discrimination, (the discrimination) is valid". This is clearly supplemented by Kh 35 (K 135, W 134, L —) which reads: 謂：辯無勝，必不當 "It is said: if there is no victory in discrimination, (the discrimination itself) must be invalid". As we shall see shortly, there is no room for a suspicion that the Mohist discrimination spoken of in these two entries was conceived in a subjective or relative sense (namely, that the victory made discrimination valid independently of the objective truth or falsity of the victorious thesis), since specific limitations are further imposed on discrimination precisely in order to ensure the objective character of the winner's thesis. I also think that in both contexts *sheng* 勝 'victory' could better be rendered as 'proper victory' (implying that the victorious thesis should be objectively true). But for the time being we shall turn to the word *pi* 彼 'that', involved in the definition of *pien*, which is an important technical term and even a specific quasi-variable, which we shall meet in other entries.[22] The definiens *cheng pi* 爭彼 "contesting the *That*" actually means that in the Mohist 'discrimination' there were two opponents, say A and B, who put forward two different theses (for the time being unspecified), say p and q or rather φa and ψa,[23] that each of these theses from the opponent's point of view was called *pi* (φa was *pi* only for B, who himself sustained the thesis ψa, and *vice versa*; our fragments

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kuo lo-tsi sï-siang shï-liao fen-si, vol. I, 1961; and L = Liu T's'un-yan [Liu T's'un-jen], *Mo-king tsien-i shang*, "*Sin-ya hüe-pao*" VI, 1, 1964, pp. 45—139. These letters are followed by the numbers the corresponding entries have in the given publications; only for Liu T's'un-jen's study, in which the entries are not numbered, the page-numbers are given. But I should like to emphasise once more that, in my opinion, most of these interpretations, involving varying punctuation within the entries and sometimes a reversal of the order of characters, tend to make obscure the relatively clear text of the entries concerned rather than to elucidate it. As has been said, Sun I-jang's text is largely satisfactory from the point of view of our problem.

[22] The phrase *cheng pi* in Ks 74 has been ingeniously translated by Graham as "contesting the other's case" ("*Being*", p. 91), which adequately renders the Mohist idea. But I think that we had better retain the literal translation of the word *pi* (which is a demonstrative corresponding to 'that' in English) precisely in order to emphasise its rôle of quasi-variable in the Mohist contexts.

[23] Because of the examples the Mohists themselves use in the entries to be quoted and also in view of the strong Chinese tendency to think and reason in terms of functions, it appears that the whole interpretation can be most adequately conceived precisely in terms of functions of the same argument. Of course, the results of such an interpretation in terms of functions can easily be retranslated in propositional terms.

do not introduce any specific term for one's own statement, but we may presume that it must have been *ts'ï* 此 'this'), and that discrimination consisted in that A contested *φa* and B contested *φa*. Such a 'reconstruction' of the actual intent of the rather simple phrase *pien, cheng pi ye* is confirmed by the other entries to be quoted, which, in fact, are concerned with the limitations to be imposed on the two *pi* of the *pien*, — limitations such as to ensure honest victory to one (and only one) of the opponents. This can be seen in the important passage Ksh 35 (K 135, W 134, L —) which is considered the 'explanation' of Kh 35 and which reads:

謂: (a) 所謂非同也則異也. (b) 同則或謂之狗, 其或謂之犬也. (c) 異則或謂之牛, 其或謂之馬也. (d) 俱無勝, 是不辯也. (e) 辯也者, 或謂之是, 或謂之非, 當者勝也.

In translation (cf. Maspero, *Notes sur la logique...*, p. 30; Graham, *"Being..."*, p. 91):

"It is said: (a) If what is spoken of [by the opponents] is not similar, it is different. (b) If similar, one says [for instance] that it is a puppy, and the other says that it is a dog. (c) If different, one says [for instance] that it is an ox, and the other says that it is a horse. (d) If there is no victory in both such cases, it is because there has not been discrimination. (e) As far as discrimination is concerned, the one says that it *is-so* (*shï*), the other says that it *is-not-so* (*fei*), and the valid [thesis] gets victory."[24]

In spite of the linguistic and stylistic qualities of the original which escape an adequate rendering even in such a pedantic and unwieldy translation as the one I have given, I think that the logical intent of the passage should be clear. The opening sentence (a) evidently echoes the Chinese discussions on 'similarity and difference' (*t'ung-i* 同異) and even appears to throw some new light on the *t'ung-i* problem — but I feel dispensed from dealing with this point here since I shall revert to it in a subsequent chapter.[25] However, from our present point of view it deserves

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[24] According to an entry in ch. 18 (*Shï-shou*) of the old dictionary *Êr-ya* (probably compiled in the 3rd century B.C.), the word *kou* 狗 — usually 'puppy, young dog' — may also designate 'young one(s) of bears or tigers'. Thus, it cannot be excluded that what is actually involved in the Mohist exemplification as given in (b) is the intersection of the classes corresponding to the predicates (*puppy or young bear or young tiger* as against *dog*), not the inclusion of one class in another (*puppy* vs. *dog*). It must however be emphasised that the *Êr-ya* entry is not substantiated by pre-Han literary texts; consequently, the usual rendering of the word *kou* as 'puppy' has been assumed also for the present context. By the way, in our context the interpretation of the word *kou* has little logical significance, since, as we shall see, sentence (b) exemplifies the possibility of co-occurrence of the two predicates with regard to the same argument according to the formula $\underset{x}{\Sigma}(\varphi x \cdot \psi x)$ — and such is the case with both the intersection and the inclusion of the corresponding classes.

[25] For the time being, cf. the best extant account of the *t'ung-i* problem in Fung-

notice that sentence (a) is an example of expressing the alternative connection by means of the operation of implication according to the equivalence $(p \vee q) \equiv (p' \supset q)$ — which procedure, as we know, is common in Chinese, cf. RO XXVI, 2, p. 103. What follows in the Chinese text, (b)—(e), is in fact a kind of reasoning with (b)—(d) corresponding to the premises and (e) corresponding to the conclusion. It is important to note that this specific form of reasoning involves examples of predicates (of one and the same argument) in the premises (*puppy* vs. *dog* in (b), and *ox* vs. *horse* in (c)), while the conclusion is formulated in abstract terms, that is, those of variables (or quasi-variables): in the present case *shï* and *fei* as they stand in (e) roughly correspond to our $\varphi\hat{x}$ and $\varphi'\hat{x}$.[26] Thus, it is clear that the examples selected for (b) and (c) should be conceived as mere illustrations of specific relations between predicates, relations such as to make invalid the very procedure of 'discrimination' in the Mohist sense of the term. This latter point is emphasised in sentence (d) which clearly, even if implicitly, rejects such pairs of predicates as those exemplified in (b) and (c) in view of the fact that they do not constitute a valid *pien* (that is, one necessarily bringing victory to one and only one of the opponents). The difference between the two types of pairs spoken of in (b) and (c) with regard to their uselessness for the 'discrimination' is not explicitly stated, but I think that the very choice of examples shows that the Mohists to a considerable extent must have been aware of this difference and its logical aspects. For, as can easily be shown, it is precisely the elimination (implied in (d)) of such pairs of predicates as those exemplified in (b) and (c) which leads to the general conclusion as was actually drawn by the Mohists in (e).

Before proceeding to a formalised account of the passage, it must be emphasised that the logical intent of (b)—(e) admits of more than one kind of formalisation, — including that in terms of a modal calculus of propositions. I shall revert to this latter point in a chapter dealing with the rudiments of Chinese modal logic, but for our present purpose I have chosen a formalisation in terms of the simple calculus of functions. This kind of formalisation appears to render very adequately the Mohist idea implicit in the passage since the examples, as we know, involve pairs of predicates (one-place functions) of the same argument, that is, expressions corresponding to our $\varphi\hat{x}$ and $\psi\hat{x}$. Now, what the Mohists must have noticed with regard to the first type of pairs ((b), *puppy* $\hat{x}$ vs. *dog* $\hat{x}$) is the fact that in such cases the opponents might both be right (the two *pi* might both be true): for some values of the argument-variable x both φx and ψx are true, that is, $\sum_x(\varphi x \cdot \psi x)$.[27] Of course, in cases of this

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B o d d e, *A History of Chinese Philosophy*, I, pp. 262—265 (where however the passage Ksh 35 has not been considered).

[26] It appears that M a s p e r o's term "raisonnement par l'exemple" might be best applied precisely to such specific forms of reasoning as the one here in question. For M a s p e r o's own use of the term, cf. his *Notes sur la logique*, p. 5 ff.

[27] Please note that this formula, extracted from (b) as it is, holds good also if we assume (according to the *Êr-ya* entry, cf. supra, p. 42, footnote 24) that the word *kou* in (b) actually means 'puppy or young bear or young tiger'.

type it may also happen that only one opponent is right (and if so, in the case of *puppy* $\hat{x}$ vs. *dog* $\hat{x}$ only the one sustaining the thesis "It is a dog"), and also that both are wrong (both "It is a puppy" and "It is a dog" are false if, for instance, the given object actually is a horse). There is nothing in the Chinese text to substantiate the assumption that the Mohists were aware of these latter facts, but this does not necessarily mean that they overlooked them. Most probably, in their search for the criteria ensuring victory to one and exactly one of the opponents — which for the Mohists was the same as imposing on the two *pi* to be submitted for 'discrimination' conditions such as to ensure objective truth to one and only one of the theses — they took special care of the cases in which it m i g h t happen that the opponents were both right (and, on the other hand, of the cases in which it m i g h t happen that the opponents were both wrong), but they were simply uninterested in what else might happen in such cases. In other words, and reverting to the examples as they stand in (b), we shall say that they typify pairs of predicates (of the same argument), $\varphi\hat{x}$ vs. $\psi\hat{x}$, bound by a specific relation, namely, that for s o m e values of the argument-variable both φx and ψx become true. It is precisely this relation between $\varphi\hat{x}$ and $\psi\hat{x}$ which is involved in the quantified formula $\underset{x}{\Sigma}(\varphi x \cdot \psi x)$. Such an interpretation of the first type is largely corroborated by the second type as exemplified in (c). What the Mohists must have noticed and emphasised with regard to this second type of pairs (*ox* $\hat{x}$ vs. *horse* $\hat{x}$) is the fact that in such cases the opponents might both be wrong, that is, for some values of the argument-variable x (if, for instance, the given object is neither an ox nor a horse, but a dog) both φx and ψx are false: $\underset{x}{\Sigma}(\varphi' x \cdot \psi' x)$. Of course, again we must note that this second type of predicates does not exclude the possibility that only one of the opponents is right, and this time such a possibility is open for both of them: either "It is an ox" or "It is a horse" (in the exclusive sense of "either... or...") may be true according to circumstances. The Mohists however simply insisted on the fact that such pairs of predicates as those exemplified in (c) actually admitted of the possibility of both φx and ψx being false, and they left out of consideration what else might happen in such cases. In other words, the examples in (c) typify pairs of predicates (one-place functions) of one and the same argument, $\varphi\hat{x}$ vs. $\psi\hat{x}$, bound by a specific relation, namely, that for s o m e values of the argument-variable x both φx and ψx become false — that is, both $\varphi' x$ and $\psi' x$ become true — and it is precisely this relation between $\varphi\hat{x}$ and $\psi\hat{x}$ which is represented by our formula $\underset{x}{\Sigma}(\varphi' x \cdot \psi' x)$. Thus, the exemplification in (b) and (c) jointly typifies pairs of predicates, $\varphi\hat{x}$ vs. $\psi\hat{x}$, such as are covered by the alternative formula $[\underset{x}{\Sigma}(\varphi x \cdot \psi x) \vee \underset{x}{\Sigma}(\varphi' x \cdot \psi' x)]$. Sentence (d), in turn, explicitly states that such pairs of predicates do not constitute a valid *pien*, and this clearly implies the elimination of all such pairs from the procedure of 'discrimination'. In sum, the actual intent of (b)—(d) is to impose on the two *pi*, $\varphi\hat{x}$ vs. $\psi\hat{x}$, the condition that they should be such as to satisfy the negation of the alternative formula

just given: $[\underset{x}{\Sigma}(\varphi x \cdot \psi x) \vee \underset{x}{\Sigma}(\varphi' x \cdot \psi' x)]'$. This latter formula yields the following equivalences:

$$[\underset{x}{\Sigma}(\varphi x \cdot \psi x) \vee \underset{x}{\Sigma}(\varphi' x \cdot \psi' x)]' \equiv \underset{x}{\Pi}(\varphi x \supset \psi' x) \cdot \underset{x}{\Pi}(\varphi' x \supset \psi x)$$

$$\underset{x}{\Pi}(\varphi x \supset \psi' x) \cdot \underset{x}{\Pi}(\varphi' x \supset \psi x) \equiv \underset{x}{\Pi}(\psi x \equiv \varphi' x)$$

As is easily seen from the final formula, $\underset{x}{\Pi}(\psi x \equiv \varphi' x)$, the Mohist condition imposed in (b)—(d) actually selects from all possible pairs of predicates only those in which one of the predicates constitutes the negation of the other (or is equivalent to such a negation): $\varphi\hat{x}$ vs. $\varphi'\hat{x}$, — and this is precisely what is stated in (e): "the one says that it *is-so* ($\varphi\hat{x}$), the other says that it *is-not-so* ($\varphi'\hat{x}$)." In the light of the present interpretation we can say that the whole of (b)—(e) is an instance of reasoning with (b)—(d) as a complex premise and (e) as conclusion. The conclusion (e) itself is not only implied by the premise but is equivalent to it.

Furthermore, such pairs, $\varphi\hat{x}$ vs. $\varphi'\hat{x}$, — and o n l y such pairs — were considered to be those constituting valid 'discrimination', that is, the disjunction of statements of which one (only one) m u s t be true and one (only one) m u s t be false. In our symbolism, this yields the disjunctive formula ($\varphi\hat{x} \veebar \varphi'\hat{x}$) which is nothing else but a specific (non-quantified) functional counterpart of the propositional tautology ($p \veebar p'$), — and this latter formula, as we know (cf. supra, p. 39), is in fact the conjunction of both the law of non-contradiction and that of excluded middle. Clearly, the endeavours of the Mohists to find and state the formal criteria for what they considered valid discrimination — and what logically was nothing else but the exclusive disjunction of two statements (about one object) such as to ensure the truth-value *"1"* to exactly one of these statements and the value *"0"* to the other — inevitably led the Mohist dialecticians to the discovery of the logical principles of non-contradiction and of excluded middle[28] together with the rather explicit quasi-

[28] Even if it was at the cost of dismissing from 'discrimination' many particular cases in which the thesis of only one of the opponents m i g h t have been true and bring its defender most honest victory. Of course, the tautology ($\varphi\hat{x} \veebar \varphi'\hat{x}$) or ($p \veebar p'$), combining the principle of non-contradiction with that of excluded middle as it does and as it was arrived at by the Mohists, only states that of two propositions standing in direct contradiction exactly one is true and one is false, but it does not state that this cannot occur in some other pair of propositions (bound up by a relation different from that of direct contradiction), cf. my remarks on the Mohist examples supra, p. 44. Thus, the discovery the Mohists made in their pursuit of dialectic ends was much more logical than dialectical, and the strong limitations imposed on the dialectic discussion *pien* were a serious shortcoming from the point of view of dialectics itself. The Mohists must have been aware of this difficulty, but extant fragments do not allow us to judge how far (and whether) they progressed in dealing with the purely dialectical aspects of the problem. I fail to see why G r a h a m considers the genuine chapters of the *Kung-sun Lung tsï* and the *Siao-ts'ü* chapter of the *Mo-tsï* "full-length examples of Discrimination" (*"Being"*, p. 91), — if in this context 'Discrimination' means the *pien* as defined in Ksh 35 and spoken of in other fragments here discussed.

conjunctional formulation of both these principles. The fact that they gave their discovery an expression corresponding to the disjunctive formulae, $(\varphi\hat{x} \veebar \varphi'\hat{x})$ or $(p \veebar p')$, unusual in our logical theory (although much less unusual in our daily practice), and put it forward as a definition of the *pien*, is logically irrelevant. The very wording of Ksh 35 (see supra, p. 42) qualifying 'valid discrimination' as that in which one says *shï* (p or $\varphi\hat{x}$) and the other says *fei* (p' or $\varphi'\hat{x}$), together with the injunction that (only) one of these two *pi* is valid, leaves no doubt that the valid *pien* logically was nothing else but the exclusive disjunction $(p \veebar p')$ or $(\varphi\hat{x} \veebar \varphi'\hat{x})$ conceived as tautologically true. This is substantially confirmed by Kss 74 (K 75, W 74, L 92; considered the 'explanation' on Ks 74 already quoted):

辯: 或謂之牛,或謂之非牛; 是爭彼也; 是不俱當; 不俱當, 必或不當.

In translation (cf. Maspero, *Notes*, p. 30; Graham, *"Being"*, p. 91):

"As for discrimination: one says that it is an ox, the other says that it is not an ox; this is contesting the *That*; these (two *Thats*) are not both valid; since they are not both valid, one necessarily is not valid".

In view of the foregoing discussion the intent of the present fragment is self-evident. Contextually the fragment is closely connected with the key passage Ksh 35 (although both are entirely separated in the *textus receptus*) and it strongly confirms our previous analysis together with its conclusions even in which it is different from Ksh 35[29]. 'Discrimination', *pien*, is once more defined as 'contesting the *That* (*pi*)' (cf. Ks 74 supra, p. 41), but this time the example (unlike that in the previous passage) concerns the two *pi* as admitted for 'valid discrimination' and fitting the formula "one says *shï*, the other says *fei*": *ox* $\hat{x}$ versus *not-ox* $\hat{x}$, that is, $\varphi\hat{x}$ and $\varphi'\hat{x}$. Furthermore, it is explicitly stated that these two (as constituting an instance of valid discrimination) "are not both valid", that is, "either $\varphi\hat{x}$, or $\varphi'\hat{x}$", as we should

[29] It is precisely in this fragment Kss 74 that Maspero found the Mohist "exposé du principe de contradiction" (*Notes*, pp. 36—37). Inversely, Graham cites this fragment (and all the others here analysed) only in connection with the principle of excluded middle, cf. supra, p. 34. Only in the recent contribution by D. Leslie (already referred to supra, p. 34, footnote 8) there are slight suggestions (based mainly on Maspero and Graham) to the effect that both the principle of (non-)contradiction and that of excluded middle are implied in the Mohist fragments, but the author's own standpoint is not clearly stated and no formal analysis of the Chinese text is attempted in his paper. It appears that all these authors have been handicapped precisely by the fact that the two principles, as involved and expressed in the Mohist fragments, correspond to the formula $(p \veebar p')$ — in which both these principles are conjunctionally "dissolved" — rather than to separate formulae of non-contradiction, $(p \cdot p')'$, and of excluded middle, $(p \vee p')$, or their explicit conjunction. On the other hand, as has already been said supra, p. 34, it is Chan Kien-feng who has the merit of being the first to emphasise that the principle of the Mohist *pien* is the conjunction (結合 'combination', as he says) of the laws of non-contradiction and of excluded middle, op. cit., p. 26 (cf. also infra, p. 49).

say. Finally, this time, unlike in the passage previously cited, the injunction is that of two such *pi* "one necessarily is not valid". In other words, 'valid discrimination' as exemplified in the present fragment is once more put forward as the disjunctive formula ($\varphi\hat{x} \veebar \varphi'\hat{x}$), and the recognition of the validity of 'discrimination' itself logically is nothing else but the recognition of the tautological quality of the corresponding disjunctive formula. To put it more accurately, we should say that the Mohist example actually is a specialised case ($\varphi_1\hat{x} \veebar \varphi_1'\hat{x}$) with $\varphi_1 = ox$, together with the recognition of the fact that the exclusive disjunction of such predicates must hold good whatever be its subject (argument). But it goes without saying that this is a stock example intended for illustrating valid *pien* in general as corresponding to the non-specialised formula ($\varphi\hat{x} \veebar \varphi'\hat{x}$). The use of the circumflex (operator of abstraction) appears to be most adequate here, since no particular argument (subject) is directly involved in the Mohist examples, all of which are directly concerned with function-terms (predicates). Since however from the Mohist point of view the validity of the *pien* was clearly dependent on the sole relation of direct contradiction between the function-terms, φ versus φ' — whatever be the function-term itself and whatever be the argument — it is clear that the example illustrates not only the formula ($\varphi\hat{x} \veebar \varphi'\hat{x}$) to be conceived as a constructional pattern of the valid *pien*, but also the quantified formula $\underset{x\ \varphi}{\Pi\Pi}(\varphi x \veebar \varphi' x)$. This latter formula precisely is the 'functional translation' of the propositional conjunction (by means of exclusive disjunction) of the laws of non-contradiction and of excluded middle, $\underset{p}{\Pi}(p \veebar p')$. A remark is still to be added on the word *tang* 當 'fitting, right', which is involved in all Mohist fragments so far discussed and which I have rendered throughout as 'valid'. It is clearly a technical term of the Mohist dialectics, used somewhat ambiguously in the sense of both 'valid; tautologically true' (in reference to the *pien* taken as a whole, or rather the disjunctive formula underlying the *pien*), and 'objectively true, fitting the facts' (in reference to a single *pi* as involved in the disjunctive *pien*). Evidently, the Mohists did not make the distinction between these two kinds of 'validity', but this cannot be a serious objection.

The rôle of negation as the only element differentiating the two *pi* of the valid *pien* is strongly emphasised in the fragments already discussed, but we have another fragment dealing specifically with negation as a logical functor in connection with the *pi*.[30] The fragment in question, Kss 73 (K 74, W 73, L 91), which is not entirely

[30] *Mutatis mutandis* the fragment can be considered the Mohist counterpart of the Stoic discussion of the problem of negation, cf. B. M a t e s, *Stoic Logic*, p. 31. Of course, I do not suggest that the Mohists had any such distinctions as those the Stoics made at both the factual and the terminological level between prefixed propositional negation (*ἀποφατικόν*), denial (*ἀρνητικόν*) and contradiction (*ἀντικείμενον*). But there can be no doubt that the Mohists were aware of the logical aspects of negation and that in particular they had a clear notion of functional negation, which if prefixed to a function term φ resulted in its contradictory φ' (cf. also T'a n K i e - f u, *Mo-king fa-wei*, p. 98).

unambiguous but, in my opinion, is sufficiently clear[31], reads: 彼：凡牛樞非牛；兩也 無以非也 — which can be most cautiously rendered as "With regard to *That*: Every ox is distinct from what is not-ox; there is no way to deny that these (*ox* and *not-ox*) are two (separate kinds)". Only the second part of the Chinese original is ambiguous, and it deserves emphasis that the present (weaker) interpretation of the whole item (substantially the same as that given by Maspero, *Notes*, p. 40) makes sufficiently good sense and does by no means invalidate our previous analysis. In particular, the second part of the passage thus understood is in line with the unambiguous first part, even if it does not add very much to this first part. But in view of the fact that the whole item is so closely connected with the notion of *That* (*pi*) in the sense that the item itself is to be conceived as a comment on the topic *pi* — while there are precisely two *pi* in the *pien* — I think that the second part of the passage would be better rendered as "... there is no way to deny the two (at the same time as constituting the two *pi* of the *pien*)". This second, stronger interpretation (suggested by Chan Kien-feng, op. cit., p. 25, and approaching that of Graham, *"Being"*, p. 91), which grammatically is as good as the first and perhaps even better, is much more in line with the whole of our analysis, since it involves another fairly explicit statement of the validity of $(\varphi\hat{x} \veebar \varphi'\hat{x})$ in the guise of a double negation ("there is no way to deny...") of the corresponding formula, $(\varphi\hat{x} \veebar \varphi'\hat{x})$". The key word for such an interpretation is the monosyllable *liang* 兩 'both, the two', which in this particular context should be taken more specifically in the sense of '*either* the one, *or* the other' rather than 'the one *and* the other'. Such a specific use of the word *liang* can be explained by the difficulties the Mohists (and the Chinese in general) must have had in expressing the exclusive disjunction (or the non-exclusive alternative), and we shall see in a while that the present assumption is confirmed by the corresponding 'canon' to which the item now under discussion, Kss 73, is the 'explanation'. The 'canon' in question, which I have deliberately shifted to the final part of our analysis, deserves our attention for more than one reason. Like the preceding item, it has been badly misinterpreted by various scholars and mistranslated by Needham.

The 'canon' in question, Ks 73 (K 74, W 73, L 91), reads: 彼：不可兩不可也，

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[31] This fragment has been badly misinterpreted by many Chinese scholars since Sun I-jang, and also mistranslated by Needham. With A. Forke (*Mê Ti*, p. 455), Maspero (*Notes*, p. 40) and Chan Kien-feng I assume that the character *ch'u* 樞 'axis, pivot' which makes little sense in this context (although it is perhaps not entirely nonsensical: "Every ox 'pivots' what is not-ox"?) is a mistake for (or graphic variant of) *k'ü* 區 'differentiate'. It is also possible that the character is to be read as *k'ü* 驅 'drive out, expel, exclude', although such an emendation, to my knowledge, has never been proposed. At any rate, there is no doubt that the item, concerned with the *pi* as it is, deals (by means of the stock-example *ox* vs. *not-ox* already met with in Kss 74) with (functional) negation as differentiating the two *pi*.

literally: "With regard to *That*: It is not admissible that the two are not admissible". The first point to be emphasised is that the 'canon' as it stands evidently is in its very wording the Mohist response to T e n g S i' s peculiar theory and practice of "both are admissible" (*liang k'o chï shuo*, cf. supra, pp. 35—37). But presumably it is also the most general and the most explicit statement (in metalogical terms) of the conjunction of the laws of non-contradiction and of excluded middle which the Chinese ever made until modern times. In C h a n K i e n - f e n g' s non-formalised account of the problem this item is given a prominent place and is explained as 不可兩可兩不可 "It is not admissible that both (the two) are admissible and that both (the two) are not admissible". This might well be a plausible emendation of the *textus receptus*, although C h a n puts it forward as a mere explanation or expansion of the 'canon' rather than a philological emendation. As we know, the 'canonical' chapters of the *Mo-tsï* belong to the most badly corrupted pre-Han texts, and the dropping of two characters, 兩 可, in a 'canon' (and precisely in such a sophisticated and repetitious one) would be easily understandable. But there is something which probably has escaped C h a n K i e n - f e n g' s notice and which makes me think that the present item may be correct in the wording it actually has in the *textus receptus*. Now, if we grant C h a n his expansion of the Chinese text, it does by no means signify that the key word *liang* 'both, the two' (for *liang* is again the key word here) has exactly the same sense in 不可兩可 and [不可] 兩不可. In the first phrase (introduced by C h a n) the word *liang* clearly has the conjunctive sense (the same as in T e n g S i' s *liang k'o*), and the phrase itself means "it is not admissible that both (p *and* p') are admissible" — which corresponds to the principle of non-contradiction, $(p \cdot p')'$[32]. But in the second phrase *liang* cannot have such a conjunctive sense. If this second phrase is conceived as "It is not admissible that both (p *and* p') are not admissible" (with the word *liang* taken in the sense 'the one *and* the other' which it has in the first case), the phrase itself will prove to be in fact equisignificant with the first, since it leads again to the formula of non-contradiction: $[(p)' \cdot (p')']'$ as equisignificant with $(p \cdot p')'$. C h a n K i e n - f e n g considers the second phrase (as involved in his expansion of the original text) the Mohist expression of the principle of excluded middle — and he has good reasons to do so as far as his own expansion is concerned — but this means that the word *liang* is conceived by him in the *alternative* sense 'the one *or* the other'; only then "it is not admissible that the two (p *or* p') are not admissible" would correspond to the formula of excluded middle, $(p \vee p')'$ as equisignificant with $(p \vee p')$. Thus, C h a n K i e n - f e n g' s expansion of the *textus receptus*, ascribing to the

[32] I have deliberately disregarded throughout this section the (rather subtle) difference between logical and metalogical formulations since the Mohists certainly were not aware of such a distinction. This does not mean that they lacked speculations which from our modern point of view are metalogical; but this is a topic to be dealt with in a separate chapter.

Mohists a distinction of the principle of non-contradiction from that of excluded middle as it does, inevitably involves two different senses, the conjunctive and the alternative, of the word *liang*. For my part, I think that the problem of the interpretation of the present item can be best solved if we assume the *disjunctive* sense ('*either* the one, *or* the other') of *liang* in this context. In my opinion, the item as it stands in the *textus receptus* is complete in itself and was actually conceived by the Mohists as "It is not admissible that *either p or p'* is not admissible". If so, Ks 73 yields the formula $(p \underline{\vee} p')$ in the guise of double negation, $(p \underline{\vee} p')''$, and is in fact the explicit quasi-conjunctional statement of the laws of non-contradiction and of excluded middle — but without any differentiation between the two. It appears that such an interpretation of the present item is better than C h a n K i e n - f e n g' s for a number of reasons. First, it involves one single (disjunctive) function of the key word *liang* instead of two (conjunctive and alternative). Second, it not only leaves the original text of the item unaltered, but makes unnecessary any expansion of the item which is considered complete as it stands. Third, it does not introduce in this particular case (and only in this case) a differentiation of the two principles, a differentiation for which there is hardly any evidence in the Mohist dialectics and which the Mohists themselves probably failed to make. Fourth, unlike C h a n K i e n - f e n g' s expansion with its distinction of the two principles, the present interpretation is in perfect agreement with the whole of the Mohist material discussed in this section and also with our formal analysis of this material. Finally, it is worthy of note that such an interpretation confirms that of Kss 73 (which is the 'explanation' of Ks 73), especially as far as the second part of the preceding item is concerned ("... there is no way to deny the two (= either *p*, or *p'*)", cf. supra, p. 48). The only difficult point in connection with the present interpretation is the specific disjunctive function of the word *liang* (or rather the construction *liang* + negative particle), which is to be assumed for the context concerned and for which there appears to be no other evidence in the whole body of early Chinese literature. This however would mean that the Mohists used the word in a specialised sense, and it seems that they had good reasons to do so, especially if we remember that they had no usual linguistic means to express what they wanted to express. In connection with this, the following points deserve emphasis. In the present case the word is involved in a negative construction and by itself is the grammatical subject of a negated verb (*liang pu*...), while the conjunctive function of *liang* is clearly typical for the construction without negation (*liang* + non-negated verb). C h a n K i e n - f e n g' s expansion of the original text itself shows that in the *liang pu* construction the word may actually be taken in the alternative sense, and that the difference between the two senses as depending on the syntactic construction (whether without or with a negative particle) is not easily noticeable. It also goes without saying that in non-formalised thinking the disjunctive function is still less easily distinguishable from the alternative, and that, consequently, the former might have been easily substituted for the latter. Finally, let me remark that the word *liang* itself appears to include some idea of 'separation' or 'opposition' between "the one" and "the other" as compos-

ing "the two"[33], and this may also have played some rôle in giving the word its specific disjunctive sense in our context. The problem whether such a disjunctive sense of *liang* (+negative particle) was to any extent justified by the ordinary usage, or only imposed on the word by the Mohist dialecticians in this particular case (and if so, whether the Mohists themselves were — or were not — fully aware of the semantic shift they had operated) must be left without answer in view of the lack of philological data.

The remarkable coherence of all six items concerned with the *pien* and discussed in this section itself speaks in favour of the foregoing formal analysis inevitably leading to the formula $(p \veebar p')$ or $(\varphi\hat{x} \veebar \varphi'\hat{x})$, together with the recognition of the tautological validity of this formula by the Mohists. In other words, in spite of all the limitations of the Mohist analysis of interpropositional relations, this analysis finally led the Mohists to the discovery and rather explicit (quasi-conjunctional) formulation of two fundamental principles of the classical two-valued logic, principles which, by the way, have not ceased to alarm philosophical minds to this day. This discovery, which was a brilliant achievement for its time and is the most important Mohist contribution to early Chinese explicit logic, belongs to the very few points which can be safely inferred from the elsewhere obscure and corrupted Mohist fragments as they now stand. The Mohists can be blamed for not differentiating between the principle of non-contradiction and that of excluded middle and for blending the two in one single formula — but such a blending is logically justified on the ground of two-valued logic, the more so as in this logic the two laws are complementary. Besides, the Mohists must have had special difficulties with the problem in view of the lack of adequate linguistic functors in their own language. Even if this lack did not make entirely impossible the intuitive use of conjunctive and alternative or disjunctive connections (all of which were indiscriminately expressed mostly by means of syntactic juxtaposition) in actual speaking or thinking, it certainly rendered extremely difficult both a differentiation of such connections and speaking or thinking a b o u t them. In these circumstances, the Mohist blending of the law of non-contradiction and that of excluded middle into a single disjunctive formula of the *pien* (together with the principle of bivalence as underlying such a blending)

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[33] This is at least what H o u W a i - l u, op. cit., p. 163, claims for the numeral *liang* in connection with an entirely different problem. To my knowledge, the word has never been discussed by grammarians from the point of view imposed on us here by the Mohist context. In such a comprehensive survey of the 'classical' Chinese grammar as is C h o u F a - k a o, *Chung-kuo ku-tai yü-fa*, there is a special paragraph on *liang* (vol. III, *Ch'eng-tai p'ien*, 1959, pp. 320—322), but the treatment is rather traditional, no distinction has been made between *liang* in positive and negative constructions, and the Mohist example here under discussion has been omitted. On the other hand, it is true that the grammarians are largely handicapped by the fact that the non-conjunctive functions of *liang* are connected only with the negative construction, while actual instances of *liang*+negative particle are very few, and even these are not sufficiently clear.

appears to be a merit rather than a shortcoming. In connection with all this it is perhaps useful to recall that in classical Greek philosophy the laws of non-contradiction and of excluded middle had been clearly differentiated and found various explicit formulations only in the *Corpus Aristotelicum*. It has by no means been my intention to compare the Mohist achievement in the field with Aristotle's logical theory. But on the other hand it is to be emphasised that, as far as extant Stoic fragments allow us to judge, the Mohist blending of the two fundamental laws into one (together with the practical implications the disjunction ($p \veebar p'$) has for the reasoning process) must have been similar to the treatment of non-contradiction and of excluded middle by the Stoics, — even if these latter were more advanced and more explicit in their formulations than the Mohists. In particular, what is clearly implicit in the formula of the Mohist *pien* might be expressed explicitly in Cicero's words: "omne ἀξίωμα [= proposition] aut verum esse aut falsum" (*De Fato*, 21); and "omne, quod ita disiunctum sit, quasi 'aut etiam aut non' non modo verum esse, sed etiam necessarium" (*Acad. II*, 97)[34]. Some other points of similarity between the Mohists and the Stoics might perhaps be found; this however is a topic which must be left without further consideration in this place.

[34] Cf. J. Łukasiewicz, *Aristotle's Syllogistic*, 2nd ed., 1958, p. 82; B. Mates, *Stoic Logic*, pp. 28—29.