CHAPTER VII

IMMEDIATE INFERENCES

Section 1. Under the general title of Immediate Inference Logicians discuss three subjects, namely, Opposition, Conversion, and Obversion; to which some writers add other forms, such as Whole and Part in Connotation, Contraposition, Inversion, *etc*. Of Opposition, again, all recognise four modes: Subalternation, Contradiction, Contrariety and Sub-contrariety. The only peculiarities of the exposition upon which we are now entering are, that it follows the lead of the three Laws of Thought, taking first those modes of Immediate Inference in which Identity is most important, then those which plainly involve Contradiction and Excluded Middle; and that this method results in separating the modes of Opposition, connecting Subalternation with Conversion, and the other modes with Obversion. To make up for this departure from usage, the four modes of Opposition will be brought together again in Section 9.

Section 2. Subalternation.—Opposition being the relation of propositions that have the same matter and differ only in form (as A., E., I., O.), propositions of the forms A. and I. are said to be Subalterns in relation to one another, and so are E. and O.; the universal of each quality being distinguished as 'subalternans,' and the particular as 'subalternate.'

It follows from the principle of Identity that, the matter of the propositions being the same, if A. is true I. is true, and that if E. is true O. is true; for A. and E. predicate something of *All S* or *All men*; and since I. and O. make the same predication of *Some S* or *Some men*, the sense of these particular propositions has already been predicated in A. or E. If *All S is P, Some S is P*; if *No S is P, Some S is not P*; or, if *All men are fond of laughing, Some men are*; if *No men are exempt from ridicule, Some men are not*.

Similarly, if I. is false A. is false; if O. is false E. is false. If we deny any predication about *Some S*, we must deny it of *All S*; since in denying it of *Some*, we have denied it of at least part of *All*; and whatever is false in one form of words is false in any other.

On the other hand, if I. is true, we do not know that A. is; nor if O. is true, that E. is; for to infer from *Some* to *All* would be going beyond the evidence. We shall see in discussing Induction that the great problem of that part of Logic is, to determine the conditions under which we may in reality transcend this rule and infer from *Some* to *All*; though even there it will appear that, formally, the rule is observed. For the present it is enough that I. is an immediate inference from A., and O. from E.; but that A. is not an immediate inference from I., nor E. from O.

Section 3. Connotative Subalternation.—We have seen (chap. iv. Section 6) that if the connotation of one term is only part of another's its denotation is greater and includes that other's. Hence genus and species stand in subaltern relation, and whatever is true of the genus is true of the species: If *All animal life is dependent on vegetation, All human life is dependent on vegetation*. On the other hand, whatever is not true of the species or narrower term, cannot be true of the whole genus: If it is false that '*All human life is happy*,' it is false that '*All animal life is happy*.'

Similar inferences may be drawn from the subaltern relation of predicates; affirming the species we affirm the genus. To take Mill's example, if *Socrates is a man, Socrates is a living creature*. On the other hand, denying the genus we deny the species: if *Socrates is not vicious, Socrates is not drunken.*

Such cases as these are recognised by Mill and Bain as immediate inferences under the principle of Identity. But some Logicians might treat them as imperfect syllogisms, requiring another premise to legitimate the conclusion, thus:

All animal life is dependent on vegetation;
All human life is animal life;
Therefore All human life is dependent on vegetation.

Or again:

All men are living creatures;
Socrates is a man;
Therefore Socrates is a living creature.

The decision of this issue turns upon the question (*cf*. chap. vi. Section 3) how far a Logician is entitled to assume that the terms he uses are understood, and that the identities involved in their meanings will be recognised. And to this question, for the sake of consistency, one of two answers is required; failing which, there remains the rule of thumb. First, it may be held that no terms are understood except those that are defined in expounding the science, such as 'genus' and 'species,' 'connotation' and 'denotation.' But very few Logicians observe this limitation; few would hesitate to substitute 'not wise' for 'foolish.' Yet by what right? Malvolio being foolish, to prove that he is not-wise, we may construct the following syllogism:

Foolish is not-wise;
Malvolio is foolish;
Therefore *Malvolio is not-wise*.

Is this necessary? Why not?

Secondly, it may be held that all terms may be assumed as understood unless a definition is challenged. This principle will justify the substitution of 'not-wise' for 'foolish'; but it will also legitimate the above cases (concerning 'human life' and 'Socrates') as immediate inferences, with innumerable others that might be based upon the doctrine of relative terms: for example, *The hunter missed his aim*: therefore, *The prey escaped*. And from this principle it will further follow that all apparent syllogisms, having one premise a verbal proposition, are immediate inferences (*cf*. chap. ix. Section 4).

Closely connected with such cases as the above are those mentioned by Archbishop Thomson as "Immediate Inferences by added Determinants" (*Laws of Thought*, Section 87). He takes the case: '*A negro is a fellow-creature*: therefore, *A negro in suffering is a fellow-creature in suffering*.' This rests upon the principle that to increase the connotations of two terms by the same attribute or determinant does not affect the relationship of their denotations, since it must equally diminish (if at all) the denotations of both classes, by excluding the same individuals, if any want the given attribute. But this principle is true only when the added attribute is not merely the same verbally, but has the same significance in qualifying both terms. We cannot argue *A mouse is an animal*; therefore, *A large mouse is a large animal*; for 'large' is an attribute relative to the normal magnitude of the thing described.

Section 4. Conversion is Immediate Inference by transposing the terms of a given proposition without altering its quality. If the quantity is also unaltered, the inference is called 'Simple Conversion'; but if the quantity is changed from universal to particular, it is called 'Conversion by limitation' or '*per accidens*.' The given proposition is called the 'convertend'; that which is derived from it, the 'converse.'

Departing from the usual order of exposition, I have taken up Conversion next to Subalternation, because it is generally thought to rest upon the principle of Identity, and because it seems to be a good method to exhaust the forms that come only under Identity before going on to those that involve Contradiction and Excluded Middle. Some, indeed, dispute the claims of Conversion to illustrate the principle of Identity; and if the sufficient statement of that principle be 'A is A,' it may be a question how Conversion or any other mode of inference can be referred to it. But if we state it as above (chap. vi. Section 3), that whatever is true in one form of words is true in any other, there is no difficulty in applying it to Conversion.

Thus, to take the simple conversion of I.,

Some S is P; Therefore Some P is S.
Some poets are business-like; Therefore Some business-like men are poets.
Here the convertend and the converse say the same thing, and this is true if that is.

We have, then, two cases of simple conversion: of I. (as above) and of E. For E.:

No S is P; Therefore No P is S.
No ruminants are carnivores; Therefore No carnivores are ruminants.

In converting I., the predicate (P) when taken as the new subject, being preindesignate, is treated as particular; and in converting E., the predicate (P), when taken as the new subject, is treated as universal, according to the rule in chap. v. Section 1.

A. is the one case of conversion by limitation:

All S is P; Therefore Some P is S.
All cats are grey in the dark; Therefore Some things grey in the dark are cats.

The predicate is treated as particular, when taking it for the new subject, according to the rule not to go beyond the evidence. To infer that *All things grey in the dark are cats* would be palpably absurd; yet no error of reasoning is commoner than the simple conversion of A. The validity of conversion by limitation may be shown thus: if, *All S is P*, then, by subalternation, *Some S is P*, and therefore, by simple conversion, *Some P is S*.

O. cannot be truly converted. If we take the proposition:

Some S is not P, to convert this into *No P is S*, or *Some P is not S*, would break the rule in chap. vi. Section 6; since *S*, undistributed in the convertend, would be distributed in the converse. If we are told that *Some men are not cooks*, we cannot infer that *Some cooks are not men*. This would be to assume that '*Some men*' are identical with '*All men*.'

By quantifying the predicate, indeed, we may convert O. simply, thus:

Some men are not cooks Therefore No cooks are some men.

And the same plan has some advantage in converting A.; for by the usual method *per accidens*, the converse of A. being I., if we convert this again it is still I., and therefore means less than our original convertend. Thus:

All S is P Therefore Some P is S Therefore Some S is P.

Such knowledge, as that *All S* (the whole of it) *is P*, is too precious a thing to be squandered in pure Logic; and it may be preserved by quantifying the predicate; for if we convert A. to Y., thus—

All S is P Therefore Some P is all S—

we may reconvert Y. to A. without any loss of meaning. It is the chief use of quantifying the predicate that, thereby, every proposition is capable of simple conversion.

The conversion of propositions in which the relation of terms is inadequately expressed (see chap. ii., Section 2) by the ordinary copula (*is* or *is not*) needs a special rule. To argue thus—

A is followed by B, Therefore Something followed by B is A—

would be clumsy formalism. We usually say, and we ought to say—

A is followed by B, Therefore *B follows A* (or *is preceded by A*).

Now, any relation between two terms may be viewed from either side—*A: B* or *B: A*. It is in both cases the same fact; but, with the altered point of view, it may present a different character. For example, in the Immediate Inference—*A* > *B Therefore B* < *A*—a diminishing turns into an increasing ratio, whilst the fact predicated remains the same. Given, then, a relation between two terms as viewed from one to the other, the same relation viewed from the other to the one may be called the Reciprocal. In the cases of Equality, Co-existence and Simultaneity, the given relation and its reciprocal are not only the same fact, but they also have the same character: in the cases of Greater and Less and Sequence, the character alters.

We may, then, state the following rule for the conversion of propositions in which the whole relation explicitly stated is taken as the copula: Transpose the terms, and for the given relation substitute its reciprocal. Thus—

A is the cause of B, Therefore B is the effect of A.

The rule assumes that the reciprocal of a given relation is definitely known; and so far as this is true it may be extended to more concrete relations—

A is a genus of B, Therefore B is a species of A

A is the father of B, Therefore B is a child of A.

But not every relational expression has only one definite reciprocal. If we are told that *A is the brother of B*, we can only infer that *B is either the brother or the sister of A*. A list of all reciprocal relations is a desideratum of Logic.

Section 5. Obversion (otherwise called Permutation or Æquipollence) is Immediate Inference by changing the quality of the given proposition and substituting for its predicate the contradictory term. The given proposition is called the 'obvertend,' and the inference from it the 'obverse.' Thus the obvertend being—*Some philosophers are consistent reasoners*, the obverse will be—*Some philosophers are not inconsistent reasoners*.

The legitimacy of this mode of reasoning follows, in the case of affirmative propositions, from the principle of Contradiction, that if any term be affirmed of a subject, the contradictory term may be denied(chap. vi. Section 3). To obvert affirmative propositions, then, the rule is—Insert the negative sign, and for the predicate substitute its contradictory term.

A. *All S is P Therefore No S is not-P*

All men are fallible Therefore No men are infallible.

I. *Some S is P Therefore some S is not-P*

Some philosophers are consistent Therefore Some philosophers are not inconsistent.

In agreement with this mode of inference, we have the rule of modern English grammar, that 'two negatives make an affirmative.'

Again, by the principle of Excluded Middle, if any term be denied of a subject, its contradictory may be affirmed: to obvert negative propositions, then, the rule is—Remove the negative sign, and for the predicate substitute its contradictory term.

E. *No S is P Therefore All S is not-P*

No matter is destructible Therefore All matter is indestructible.

O. *Some S is not P Therefore Some S is not-P*

Some ideals are not attainable Therefore Some ideals are unattainable.

Thus, by obversion, each of the four propositions retains its quantity but changes its quality: A. to E., I. to O., E. to A., O. to I. And all the obverses are infinite propositions, the affirmative infinites having the sense of negatives, and the negative infinites having the sense of affirmatives.

Again, having obtained the obverse of a given proposition, it may be desirable to recover the obvertend; or it may at any time be requisite to change a given infinite proposition into the corresponding direct affirmative or negative; and in such cases the process is still obversion. Thus, if *No S is not-P* be given us to recover the obvertend or to find the corresponding affirmative; the proposition being formally negative, we apply the rule for obverting negatives: 'Remove the negative sign, and for the predicate substitute its contradictory.' This yields the affirmative *All S is P*. Similarly, to obtain the obvertend of *All S is not-P*, apply the rule for obverting Affirmatives; and this yields *No S is P*.

Section 6. Contrariety.—We have seen in chap. iv. Section 8, that contrary terms are such that no two of them are predicable in the same way of the same subject, whilst perhaps neither may be predicable of it. Similarly, Contrary Propositions may be defined as those of which no two are ever both true together, whilst perhaps neither may be true; or, in other words, both may be false. This is the relation between A. and E. when concerned with the same matter: as A.—*All men are wise*; E.—*No men are wise*. Such propositions cannot both be true; but they may both be false, for some men may be wise and some not. They cannot both be true; for, by the principle of Contradiction, if *wise* may be affirmed of *All men, not-wise* must be denied; but *All men are not-wise* is the obverse of *No men are wise*, which therefore may also be denied.

At the same time we cannot apply to A. and E. the principle of Excluded Middle, so as to show that one of them must be true of the same matter. For if we deny that *All men are wise*, we do not necessarily deny the attribute 'wise' of each and every man: to say that *Not all are wise* may mean no more than that *Some are not*. This gives a proposition in the form of O.; which, as we have seen, does not imply its subalternans, E.

If, however, two Singular Propositions, having the same matter, but differing in quality, are to be treated as universals, and therefore as A. and E., they are, nevertheless, contradictory and not merely contrary; for one of them must be false and the other true.

Section 7. Contradiction is a relation between two propositions analogous to that between contradictory terms (one of which being affirmed of a subject the other is denied)—such, namely, that one of them is false and the other true. This is the case with the forms A. and O., and E. and I., in the same matter. If it be true that *All men are wise*, it is false that *Some men are not wise* (equivalent by obversion to *Some men are not-wise*); or else, since the 'Some men' are included in the 'All men,' we should be predicating of the same men that they are both 'wise' and 'not-wise'; which would violate the principle of Contradiction. Similarly, *No men are wise*, being by obversion equivalent to *All men are not-wise*, is incompatible with *Some men are wise*, by the same principle of Contradiction.

But, again, if it be false that *All men are wise*, it is always true that *Some are not wise*; for though in denying that 'wise' is a predicate of 'All men' we do not deny it of each and every man, yet we deny it of 'Some men.' Of 'Some men,' therefore, by the principle of Excluded Middle, 'not-wise' is to be affirmed; and *Some men are not-wise*, is by obversion equivalent to *Some men are not wise*. Similarly, if it be false that *No men are wise*, which by obversion is equivalent to *All men are not-wise*, then it is true at least that *Some men are wise*.

By extending and enforcing the doctrine of relative terms, certain other inferences are implied in the contrary and contradictory relations of propositions. We have seen in chap. iv. that the contradictory of a given term includes all its contraries: 'not-blue,' for example, includes red and yellow. Hence, since *The* *sky is blue* becomes by obversion, *The sky is not not-blue*, we may also infer *The sky is not red, etc*. From the truth, then, of any proposition predicating a given term, we may infer the falsity of all propositions predicating the contrary terms in the same relation. But, on the other hand, from the falsity of a proposition predicating a given term, we cannot infer the truth of the predication of any particular contrary term. If it be false that *The sky is red*, we cannot formally infer, that *The sky is blue* (*cf*. chap. iv. Section 8)

Section 8. Sub-contrariety is the relation of two propositions, concerning the same matter that may both be true but are never both false. This is the case with I. and O. If it be true that *Some men are wise*, it may also be true that *Some (other) men are not wise*. This follows from the maxim in chap. vi. Section 6, not to go beyond the evidence.

For if it be true that *Some men are wise*, it may indeed be true that *All are* (this being the subalternans): and if *All are*, it is (by contradiction) false that *Some are not*; but as we are only told that *Some men are*, it is illicit to infer the falsity of *Some are not*, which could only be justified by evidence concerning *All men*.

But if it be false that *Some men are wise*, it is true that *Some men are not wise*; for, by contradiction, if *Some men are wise* is false, *No men are wise* is true; and, therefore, by subalternation, *Some men are not wise* is true.

Section 9. The Square of Opposition.—By their relations of Subalternation, Contrariety, Contradiction, and Sub-contrariety, the forms A. I. E. O. (having the same matter) are said to stand in Opposition: and Logicians represent these relations by a square having A. I. E. O. at its corners:

As an aid to the memory, this diagram is useful; but as an attempt to represent the logical relations of propositions, it is misleading. For, standing at corners of the same square, A. and E., A. and I., E. and O., and I. and O., seem to be couples bearing the same relation to one another; whereas we have seen that their relations are entirely different.

The following traditional summary of their relations in respect of truth and falsity is much more to the purpose:

(1)	If A. is true,	I. is true,	E. is false,	O. is false.
(2)	If A. is false,	I. is unknown,	E. is unknown,	O. is true.
(3)	If I. is true,	A. is unknown,	E. is false,	O. is unknown.
(4)	If I. is false,	A. is false,	E. is true,	O. is true.
(5)	If E. is true,	A. is false,	I. is false,	O. is true.
(6)	If E. is false,	A. is unknown,	I. is true,	O. is unknown.
(7)	If O. is true,	A. is false,	I. is unknown,	E. is unknown.
(8)	If O. is false,	A. is true,	I. is true,	E. is false.

Where, however, as in cases 2, 3, 6, 7, alleging either the falsity of universals or the truth of particulars, it follows that two of the three Opposites are unknown, we may conclude further that one of them must be true and the other false, because the two unknown are always Contradictories.

Section 10. Secondary modes of Immediate Inference are obtained by applying the process of Conversion or Obversion to the results already obtained by the other process. The best known secondary form of Immediate Inference is the Contrapositive, and this is the converse of the obverse of a given proposition. Thus:

DATUM.	OBVERSE.	CONTRAPOSITIVE.
A. *All S is P*	*Therefore No S is not-P*	*Therefore No not-P is S*
I. *Some S is P*	*Therefore Some S is not not-P*	*Therefore* (none)
E. *No S is P*	*Therefore All S is not-P*	*Therefore Some not-P is S*
O. *Some S is not P*	*Therefore Some S is not-P*	*Therefore Some not-P is S*

There is no contrapositive of I., because the obverse of I. is in the form of O., and we have seen that O. cannot be converted. O., however, has a contrapositive (*Some not-P is S*); and this is sometimes given instead of the converse, and called the 'converse by negation.'

Contraposition needs no justification by the Laws of Thought, as it is nothing but a compounding of conversion with obversion, both of which processes have already been justified. I give a table opposite of the other ways of compounding these primary modes of Immediate Inference.

		A.	I.	E.	O.
	1	All A is B.	Some A is B.	No A is B.	Some A is not B.
Obverse.	2	No A is b.	Some A is not b.	All A is b.	Some A is b.
Converse.	3	Some B is A.	Some B is A.	No B is A.	—
Obverse of Converse.	4	Some B is not a.	Some B is not a.	All B is a.	—
Contrapositive.	5	No b is A.	—	Some b is A.	Some b is A.
Obverse of Contrapositive.	6	All b is a.	—	Some b is not a.	Some b is not a.
Converse of Obverse of Converse.	7	—	—	Some a is B.	—
Obverse of Converse of Obverse of Converse.	8	—	—	Some a is not b.	—
Converse of Obverse of Contrapositive.	9	Some a is b.	—	—	—
Obverse of Converse of Obverse of Contrapositive.	10	Some a is not B.	—	—	—

In this table *a* and *b* stand for *not-A* and *not-B* and had better be read thus: for *No A is b, No A is not-B*; for *All b is a* (col. 6), *All not-B is not-A*; and so on.

It may not, at first, be obvious why the process of alternately obverting and converting any proposition should ever come to an end; though it will, no doubt, be considered a very fortunate circumstance that it always does end. On examining the results, it will be found that the cause of its ending is the inconvertibility of O. For E., when obverted, becomes A.; every A, when converted, degenerates into I.; every I., when obverted, becomes O.; O cannot be converted, and to obvert it again is merely to restore the former proposition: so that the whole process moves on to inevitable dissolution. I. and O. are exhausted by three transformations, whilst A. and E. will each endure seven.

Except Obversion, Conversion and Contraposition, it has not been usual to bestow special names on these processes or their results. But the form in columns 7 and 10 (*Some a is B—Some a is not B*), where the original predicate is affirmed or denied of the contradictory of the original subject, has been thought by Dr. Keynes to deserve a distinctive title, and he has called it the 'Inverse.' Whilst the Inverse is one form, however, Inversion is not one process, but is obtained by different processes from E. and A. respectively. In this it differs from Obversion, Conversion, and Contraposition, each of which stands for one process.

The Inverse form has been objected to on the ground that the inference *All A is B _ Some not-A is not B*, distributes *B* (as predicate of a negative proposition), though it was given as undistributed (as predicate of an affirmative proposition). But Dr. Keynes defends it on the ground that (1) it is obtained by obversions and conversions which are all legitimate and (2) that although *All A is B* does not distribute *B* in relation to *A*, it does distribute *B* in relation to some *not-A* (namely, in relation to whatever *not-A* is *not-B*). This is one reason why, in stating the rule in chap. vi. Section 6, I have written: "an immediate inference ought to contain nothing that is not contained, *or formally implied*, in the proposition from which it is inferred"; and have maintained that every term formally implies its contradictory within the *suppositio*.

Section 11. Immediate Inferences from Conditionals are those which consist—(1) in changing a Disjunctive into a Hypothetical, or a Hypothetical into a Disjunctive, or either into a Categorical; and (2) in the relations of Opposition and the equivalences of Obversion, Conversion, and secondary or compound processes, which we have already examined in respect of Categoricals. As no new principles are involved, it may suffice to exhibit some of the results.

We have already seen (chap. v. Section 4) how Disjunctives may be read as Hypotheticals and Hypotheticals as Categoricals. And, as to Opposition, if we recognise four forms of Hypothetical A. I. E. O., these plainly stand to one another in a Square of Opposition, just as Categoricals do. Thus A. and E. (*If A is B, C is D*, and *If A is B, C is not D*) are contraries, but not contradictories; since both may be false (*C* may sometimes be *D*, and sometimes not), though they cannot both be true. And if they are both false, their subalternates are both true, being respectively the contradictories of the universals of opposite quality, namely, I. of E., and O. of A. But in the case of Disjunctives, we cannot set out a satisfactory Square of Opposition; because, as we saw (chap. v. Section 4), the forms required for E. and O. are not true Disjunctives, but Exponibles.

The Obverse, Converse, and Contrapositive, of Hypotheticals (admitting the distinction of quality) may be exhibited thus:

Datum.	Obverse.
A. *If A is B, C is D*	*If A is B, C is not d*
I. Sometimes *when A is B, C is D*	Sometimes *when A is B, C is not d*
E. *If A is B, C is not D*	*If A is B, C is d*
O. Sometimes *when A is B, C is not D*	Sometimes *when A is B, C is d*

Converse.	Contrapositive.
Sometimes *when C is D, A is B*	*If C is d, A is not B*
Sometimes *when C is D, A is B*	(none)
If C is D, A is not B	Sometimes *when C is d, A is B*
(none)	Sometimes *when C is d, A is B*

As to Disjunctives, the attempt to put them through these different forms immediately destroys their disjunctive character. Still, given any proposition in the form *A is either B or C*, we can state the propositions that give the sense of obversion, conversion, *etc*., thus:

Datum.—*A is either B or C;*
Obverse.—*A is not both b and c;*
Converse.—*Something, either B or C, is A;*
Contrapositive.—*Nothing that is both b and c is A*.

For a Disjunctive in I., of course, there is no Contrapositive. Given a Disjunctive in the form *Either A is B or C is D*, we may write for its Obverse—*In no case is A, b, and C at the same time d*. But no Converse or Contrapositive of such a Disjunctive can be obtained, except by first casting it into the hypothetical or categorical form.

The reader who wishes to pursue this subject further, will find it elaborately treated in Dr. Keynes' *Formal Logic*, Part II.; to which work the above chapter is indebted.