CHAPTER XVIII.

Of Reduction.

Section 667. We revert now to the standpoint of the old logicians, who regarded the Dictum de Omni et Nullo as the principle of all syllogistic reasoning. From this point of view the essence of mediate inference consists in showing that a special case, or class of cases, comes under a general rule. But a great deal of our ordinary reasoning does not conform to this type. It was therefore judged necessary to show that it might by a little manipulation be brought into conformity with it. This process is called Reduction.

Section 668. Reduction is of two kinds--

(1) Direct or Ostensive.

(2) Indirect or Ad Impossibile.

Section 669. The problem of direct, or ostensive, reduction is this--

> Given any mood in one of the imperfect figures (II, III and IV) how to alter the form of the premisses so as to arrive at the same conclusion in the perfect figure, or at one from which it can be immediately inferred. The alteration of the premisses is effected by means of immediate inference and, where necessary, of transposition.

Section 670. The problem of indirect reduction, or reductio (per deductionem) ad impossibile, is this--Given any mood in one of the imperfect figures, to show by means of a syllogism in the perfect figure that its conclusion cannot be false.

Section 671. The object of reduction is to extend the sanction of the Dictum de Omni et Nullo to the imperfect figures, which do not obviously conform to it.

Section 672. The mood required to be reduced is called the Reducend; that to which it conforms, when reduced, is called the Reduct.

Direct or Ostensive Reduction.

Section 673. In the ordinary form of direct reduction, the only kind of immediate inference employed is conversion, either simple or by limitation; but the aid of permutation and of conversion by negation and by contraposition may also be resorted to.

Section 674. There are two moods, Baroko and Bokardo, which cannot be reduced ostensively except by the employment of some of the means last mentioned. Accordingly, before the introduction of permutation into the scheme of logic, it was necessary to have recourse to some other expedient, in order to demonstrate the validity of these two moods. Indirect reduction was therefore devised with a special view to the requirements of Baroko and Bokardo: but the method, as will be seen, is equally applicable to all the moods of the imperfect figures.

Section 675. The mnemonic lines, 'Barbara, Celarent, etc., provide complete directions for the ostensive reduction of all the moods of the second, third, and fourth figures to the first, with the exception of Baroko and Bokardo. The application of them is a mere mechanical trick, which will best be learned by seeing the process performed.

Section 676. Let it be understood that the initial consonant of each name of a figured mood indicates that the reduct will be that mood which begins with the same letter. Thus the B of Bramantip indicates that Bramantip, when reduced, will become Barbara.

Section 677. Where m appears in the name of a reducend, me shall have to take as major that premiss which before was minor, and vice versa-in other words, to transpose the premisses, m stands for mutatio or metathesis.

Section 678. s, when it follows one of the premisses of a reducend, indicates that the premiss in question must be simply converted; when it follows the conclusion, as in Disamis, it indicates that the conclusion arrived at in the first figure is not identical in form with the original conclusion, but capable of being inferred from it by simple conversion. Hence s in the middle of a name indicates something to be done to the original premiss, while s at the end indicates something to be done to the new conclusion.

Section 679. P indicates conversion per accidens, and what has just been said of s applies, mutatis mutandis, to p.

Section 680. k may be taken for the present to indicate that Baroko and Bokardo cannot be reduced ostensively.

Section 681. FIGURE II.

```
Cesare.        \       /  Celarent.
No A is B.      \  =  /   No B is A.
All C is B.     /     \   All C is B.
.'. No C is A. /       \  .'. No C is A.

Camestres.     \       /  Celarent.
All A is B.     \  =  /   No B is C.
No C is B.      /     \   All A is B.
.'. No C is A. /       \  .'. No A is C.
                          .'. No C is A.

Festino.                   Ferio.
No A is B.          \     / No B is A.
Some C is B.         | = |  Some C is B.
.'. Some C is not A./     \ .'. Some C is not A.
                 [Baroko]
```

Section 682. FIGURE III.

```
Darapti.         \     /   Darii.
All B is A.       \ = /    All B is A.
All B is C.       /   \    Some C is B.
.'. Some C is A. /     \   Some C is A.

Disamis.         \     /   Darii.
Some B is A.      \ = /    All B is C.
All B is C.       /   \    Some A is B.
.'. Some C is A. /     \   .'. Some A is C.
                           .'. Some C is A.

Datisi.          \     / Darii.
All B is A.       \ = /  All B is A.
Some B is C.      /   \  Some C is B.
.'. Some C is A. /     \ .'. Some C is A.

Felapton.            \     / Ferio.
No B is A.            \ = /  No B is A.
All B is C.           /   \  Some C is B.
.'. Some C is not-A. /     \ .'. Some C is not-A.

[Bokardo].

Ferison.             \     / Ferio.
No B is A.            \ = /  No B is A.
Some B is C.          /   \  Some C is B
.'. Some C is not A. /     \ .'. Some C is not A.
```

Section 683. FIGURE IV.

```
Bramantip.      \     / Barbara.
All A is B.      \ = /  All B is C.
All B is C.      /   \  All A is B.
.. Some C is A. /     \ .. All A is C.
                        .'. Some C is A.

Camenes              Celarent
All A is B   \     / No B is C.
No B is C.    | = |  All A is B.
.. No C is A./     \ .'. No A is C.
                    .'. No C is A.

Dimaris.              Darii.
Some A is B.    \     / All B is C.
All B is C.      | = |  Some A is B.
.'. Some C is A./     \ .'. Some A is C.
                        .'. Some C is A.

Fesapo.                  Ferio.
No A is B.          \     / No B is A.
All B is C.          | = |  Some C is B.
.'. Some C is not A./     \ .'. Some C is not A.

Fresison.                Ferio.
No A is B.          \     / No B is A.
Some B is C.         | = |  Some C is B.
.'. Some C is not A./     \ .'. Some C is not A.
```

Section 684. The reason why Baroko and Bokardo cannot be reduced ostensively by the aid of mere conversion becomes plain on an inspection of them. In both it is necessary, if we are to obtain the first figure, that the position of the middle term should be changed in one premiss. But the premisses of both consist of A and 0 propositions, of which A admits only of conversion by limitation, the effect of which would be to produce two particular premisses, while 0 does not admit of conversion at all,

It is clear then that the 0 proposition must cease to be 0 before we can get any further. Here permutation comes to our aid; while conversion by negation enables us to convert the A proposition, without loss of quantity, and to elicit the precise conclusion we require out of the reduct of Boltardo.

(Baroko) Fanoao.   Ferio.
All A is B.   \   / No not-B is A.
Some C is not-B. | = | Some C is not-B.
.'. Some C is not-A./   \ .'. Some C is not-A.

(Bokardo) Donamon.   Darii.
Some B is not-A.   \   / All B is C.
All B is C. | = | Some not-A is B
.'. Some C is not-A./   \ .'. Some not-A is C.
                              .'. Some C is not-A.

Section 685. In the new symbols, Fanoao and Donamon, [pi] has been adopted as a symbol for permutation; n signifies conversion by negation. In Donamon the first n stands for a process which resolves itself into permutation followed by simple conversion, the second for one which resolves itself into simple conversion followed by permutation, according to the extended meaning which we have given to the term 'conversion by negation.' If it be thought desirable to distinguish these two processes, the ugly symbol Do[pi]samos[pi] may be adopted in place of Donamon.

Section 686. The foregoing method, which may be called Reduction by Negation, is no less applicable to the other moods of the second figure than to Baroko. The symbols which result from providing for its application would make the second of the mnemonic lines run thus--

Benare[pi], Cane[pi]e, Denilo[pi], Fano[pi]o secundae.

Section 687. The only other combination of mood and figure in which it will be found available is Camenes, whose name it changes to Canene.

Section 688.

(Cesare) Benarea.   Barbara.
No A is B.   \   / All B is not-A.
All C is B. | = | All C is B.
.'. No C is A.   /   \ .'. All C is not-A.
                              .'. No C is A.

(Camestres) Cane[pi]e.   Celarent.
All A is B.   \   / No not-B is A.
No C is B. | = | All C is not-B.
.'. No C is A.   /   \ .'. No C is A.

(Festino) Denilo[pi].   Darii.
No A is B.   \   / All B is not-A.

```
  Some C is B.        | = |  Some C is B.
  .'. Some C is not A./     \ .'. Some C is not-A.
                          .'. Some C is not A.

  (Camenes) Canene.          Celarent.
  All A is B.        \     / No not-B is A.
  No B is C.          | = |  All C is not-B.
  .'. No C is A.     /     \ .'. No C is A.
```

Section 689. The following will serve as a concrete instance of Cane[pi]e reduced to the first figure.

All things of which we have a perfect idea are perceptions.
A substance is not a perception.
.'. A substance is not a thing of which we have a perfect idea.

When brought into Celarent this becomes--

No not-perception is a thing of which we have a perfect idea.
A substance is a not-perception.
.'. No substance is a thing of which we have a perfect idea.

Section 690. We may also bring it, if we please, into Barbara, by permuting the major premiss once more, so as to obtain the contrapositive of the original--

All not-perceptions are things of which we have an imperfect idea.
All substances are not-perceptions.
.'. All substances are things of which we have an imperfect idea.

Indirect Reduction.

Section 691. We will apply this method to Baroko.

```
  All A is B.          All fishes are oviparous.
  Some C is not B.      Some marine animals are not oviparous.
  .'. Some C is not A.  .'. Some marine animals are not fishes.
```

Section 692. The reasoning in such a syllogism is evidently conclusive: but it does not conform, as it stands, to the first figure, nor (permutation apart) can its premisses be twisted into conformity with it. But though we cannot prove the conclusion true in the first figure, we can employ that figure to prove that it cannot be false, by showing that the supposition of its falsity would involve a contradiction of one of the original premisses, which are true ex hypothesi.

Section 693. If possible, let the conclusion 'Some C is not A' be false. Then its contradictory 'All C is A' must be true. Combining this as minor with the original major, we obtain premisses in the first figure,

All A is B,   All fishes are oviparous,
All C is A,   All marine animals are fishes,

which lead to the conclusion

All C is B,   All marine animals are oviparous.

But this conclusion conflicts with the original minor, 'Some C is not B,' being its contradictory. But the original minor is ex hypothesi true. Therefore the new conclusion is false. Therefore it must either be wrongly drawn or else one or both of its premisses must be false. But it is not wrongly drawn; since it is drawn in the first figure, to which the Dictum de Omni et Nullo applies. Therefore the fault must lie in the premisses. But the major premiss, being the same with that of the original syllogism, is ex hypothesi true. Therefore the minor premiss, 'All C is A,' is false. But this being false, its contradictory must be true. Now its contradictory is the original conclusion, 'Some C is not A,' which is therefore proved to be true, since it cannot be false.

Section 694. It is convenient to represent the two syllogisms in juxtaposition thus--

Baroko.		Barbara.
All A is B.		All A is B.
Some C is not B.	\/	All C is A.
.'. Some C is not A.	/\	All C is B.

Section 695. The lines indicate the propositions which conflict with one another. The initial consonant of the names Baroko and Eokardo indicates that the indirect reduct will be Barbara. The k indicates that the O proposition, which it follows, is to be dropped out in the new syllogism, and its place supplied by the contradictory of the old conclusion.

Section 696. In Bokardo the two syllogisms will stand thus--

```
   Bokardo.                Barbara.
 Some B is not A.    \ / All C is A.
 All B is C.          X  All B is C.
 .'. Some C is not A./ \ .'. All B is A.
```

Section 697. The method of indirect reduction, though invented with a special view to Baroko and Bokardo, is applicable to all the moods of the imperfect figures. The following modification of the mnemonic lines contains directions for performing the process in every case:--Barbara, Celarent, Darii, Ferioque prioris; Felake, Dareke, Celiko, Baroko secundae; Tertia Cakaci, Cikari, Fakini, Bekaco, Bokardo, Dekilon habet; quarta insuper addit Cakapi, Daseke, Cikasi, Cepako, Cesïkon.

Section 698. The c which appears in two moods of the third figure, Cakaci and Bekaco, signifies that the new conclusion is the contrary, instead of, as usual, the contradictory of the discarded premiss.

Section 699. The letters s and p, which appear only in the fourth figure, signify that the new conclusion does not conflict directly with the discarded premiss, but with its converse, either simple or per accidens, as the case may be.

Section 700. l, n and r are meaningless, as in the original lines.