

CHAPTER XXIX.

Of Trains of Reasoning.

Section 800. The formal logician is only concerned to examine whether the conclusion duly follows from the premisses: he need not concern himself with the truth or falsity of his data. But the premisses of one syllogism may themselves be conclusions deduced from other syllogisms, the premisses of which may in their turn have been established by yet earlier syllogisms. When syllogisms are thus linked together we have what is called a Train of Reasoning.

Section 801. It is plain that all truths cannot be established by reasoning. For the attempt to do so would involve us in an infinite regress, wherein the number of syllogisms required would increase at each step in a geometrical ratio. To establish the premisses of a given syllogism we should require two preceding syllogisms; to establish their premisses, four; at the next step backwards, eight; at the next, sixteen; and so on ad infinitum. Thus the very possibility of reasoning implies truths that are known to us prior to all reasoning; and, however long a train of reasoning may be, we must ultimately come to truths which are either self-evident or are taken for granted.

Section 802. Any syllogism which establishes one of the premisses of another is called in reference to that other a Pro-syllogism, while a syllogism which has for one of its premisses the conclusion of another syllogism is called in reference to that other an Epi-syllogism.

The Epicheirema.

Section 803. The name Epicheirema is given to a syllogism with one or both of its premisses supported by a reason. Thus the following is a double epicheirema--

All B is A, for it is E.
All C is B, for it is F.
∴ All C is A.

All virtue is praiseworthy, for it promotes the general welfare.
Generosity is a virtue, for it prompts men to postpone self to others.
∴ Generosity is praiseworthy.

Section 804. An epicheirema is said to be of the first or second order according as the major or minor premiss is thus supported. The double epicheirema is a combination of the two orders.

Section 805. An epicheirema, it will be seen, consists of one syllogism fully expressed together with one, or, it may be, two enthymemes (Section 557). In the above instance, if the reasoning which supports the premisses were set forth at full length, we should have, in place of the enthymemes, the two following pro-syllogisms--

- (i) All E is A.
All B is E.
∴ All B is A.

Whatever promotes the general welfare is praiseworthy.
Every virtue promotes the general welfare.
∴ Every virtue is praiseworthy.

- (2) All F is B.
All C is F.
∴ All C is B.

Whatever prompts men to postpone self to others is a virtue.
Generosity prompts men to postpone self to others.
∴ Generosity is a virtue.

Section 806. The enthymemes in the instance above given are both of the first order, having the major premiss suppressed. But there is nothing to prevent one or both of them from being of the second order--

- All B is A, because all F is.
- All C is B, because all F is.
- ∴ All C is A.

All Mahometans are fanatics, because all Monotheists are.
These men are Mahometans, because all Persians are.
∴ These men are fanatics.

Here it is the minor premiss in each syllogism that is suppressed, namely,

- (1) All Mahometans are Monotheists.
- (2) These men are Persians.

The Sorites.

Section 807. The Sorites is the neatest and most compendious form that can be assumed by a train of reasoning.

Section 808. It is sometimes more appropriately called the chain-argument, and may be defined as--

A train of reasoning, in which one premiss of each epi-syllogism is supported by a pro-syllogism, the other being taken for granted.

This is its inner essence.

Section 809. In its outward form it may be described as--A series of propositions, each of which has one term in common with that which preceded it, while in the conclusion one of the terms in the last proposition becomes either subject or predicate to one of the terms in the first.

Section 810. A sorites may be either--

(1) Progressive,

or (2) Regressive.

Progressive Sorites.

All A is B.
All B is C.
All C is D.
All D is E.
∴ All A is E.

Regressive Sorites.

All D is E.
All C is D.
All B is C.
All A is B.
∴ All A is E.

Section 811. The usual form is the progressive; so that the sorites is

commonly described as a series of propositions in which the predicate of each becomes the subject of the next, while in the conclusion the last predicate is affirmed or denied of the first subject. The regressive form, however, exactly reverses these attributes; and would require to be described as a series of propositions, in which the subject of each becomes the predicate of the next, while in the conclusion the first predicate is affirmed or denied of the last subject.

Section 812. The regressive sorites, it will be observed, consists of the same propositions as the progressive one, only written in reverse order. Why then, it may be asked, do we give a special name to it, though we do not consider a syllogism different, if the minor premiss happens to precede the major? It is because the sorites is not a mere series of propositions, but a compressed train of reasoning; and the two trains of reasoning may be resolved into their component syllogisms in such a manner as to exhibit a real difference between them.

Section 813. The Progressive Sorites is a train of reasoning in which the minor premiss of each epi-syllogism is supported by a pro-syllogism, while the major is taken for granted.

Section 814. The Regressive Sorites is a train of reasoning in which the major premiss of each epi-syllogism is supported by a pro-syllogism, while the minor is taken for granted.

Progressive Sorites.

(1) All B is C.
All A is B.
∴ All A is C.

(2) All C is D.
All A is C.
∴ All A is D.

(3) All D is E.
All A is D.
∴ All A is E.

Regressive Sorites.

(1) All D is E.
All C is D.
∴ All C is E.

(2) All C is E.

All B is C.
∴ All B is E.

(3) All B is E.
All A is B.
∴ All A is E.

Section 815. Here is a concrete example of the two kinds of sorites,
resolved each into its component syllogisms--

Progressive Sorites.

All Bideford men are Devonshire men.
All Devonshire men are Englishmen.
All Englishmen are Teutons.
All Teutons are Aryans.
∴ All Bideford men are Aryans.

(1) All Devonshire men are Englishmen.
All Bideford men are Devonshire men.
∴ All Bideford men are Englishmen.

(2) All Englishmen are Teutons.
All Bideford men are Englishmen.
∴ All Bideford men are Teutons.

(3) All Teutons are Aryans.
All Bideford men are Teutons.
∴ All Bideford men are Aryans.

Regressive Sorites.

All Teutons are Aryans.
All Englishmen are Teutons.
All Devonshiremen are Englishmen.
All Bideford men are Devonshiremen.
∴ All Bideford men are Aryans.

(1) All Teutons are Aryans.
All Englishmen are Teutons.
∴ All Englishmen are Aryans.

(2) All Englishmen are Aryans.
All Devonshiremen are Englishmen.
∴ All Devonshiremen are Aryans.

- (3) All Devonshiremen are Aryans.
All Bideford men are Devonshiremen.
∴ All Bideford men are Aryans.

Section 816. When expanded, the sorites is found to contain as many syllogisms as there are propositions intermediate between the first and the last. This is evident also on inspection by counting the number of middle terms.

Section 817. In expanding the progressive form we have to commence with the second proposition of the sorites as the major premiss of the first syllogism. In the progressive form the subject of the conclusion is the same in all the syllogisms; in the regressive form the predicate is the same. In both the same series of means, or middle terms, is employed, the difference lying in the extremes that are compared with one another through them.

[Illustration]

Section 818. It is apparent from the figure that in the progressive form we work from within outwards, in the regressive form from without inwards. In the former we first employ the term 'Devonshiremen' as a mean to connect 'Bideford men' with 'Englishmen'; next we employ 'Englishmen' as a mean to connect the same subject 'Bideford men' with the wider term 'Teutons'; and, lastly, we employ 'Teutons' as a mean to connect the original subject 'Bideford men' with the ultimate predicate 'Aryans.'

Section 819. Reversely, in the regressive form we first use 'Teutons' as a mean whereby to bring 'Englishmen' under 'Aryans'; next we use 'Englishmen' as a mean whereby to bring 'Devonshiremen' under the same predicate 'Aryans'; and, lastly, we use 'Devonshiremen' as a mean whereby to bring the ultimate subject 'Bideford men' under the original predicate 'Aryans.'

Section 820. A sorites may be either Regular or Irregular.

Section 821. In the regular form the terms which connect each proposition in the series with its predecessor, that is to say, the middle terms, maintain a fixed relative position; so that, if the middle term be subject in one, it will always be predicate in the other, and vice versa. In the irregular form this symmetrical arrangement is violated.

Section 822. The syllogisms which compose a regular sorites, whether progressive or regressive, will always be in the first figure.

In the irregular sorites the syllogisms may fall into different figures.

Section 823. For the regular sorites the following rules may be laid down.

(1) Only one premiss can be particular, namely, the first, if the sorites be progressive, the last, if it be regressive.

(2) Only one premiss can be negative, namely, the last, if the sorites be progressive, the first, if it be regressive.

Section 824. Proof of the Rules for the Regular Sorites.

(1) In the progressive sorites the proposition which stands first is the only one which appears as a minor premiss in the expanded form. Each of the others is used in its turn as a major. If any proposition, therefore, but the first were particular, there would be a particular major, which involves undistributed middle, if the minor be affirmative, as it must be in the first figure.

In the regressive sorites, if any proposition except the last were particular, we should have a particular conclusion in the syllogism in which it occurred as a premiss, and so a particular major in the next syllogism, which again is inadmissible, as involving undistributed middle.

(2) In the progressive sorites, if any premiss before the last were negative, we should have a negative conclusion in the syllogism in which it occurs. This would necessitate a negative minor in the next syllogism, which is inadmissible in the first figure, as involving illicit process of the major.

In the regressive sorites the proposition which stands first is the only one which appears as a major premiss in the expanded form. Each of the others is used in its turn as a minor. If any premiss, therefore, but the first were negative, we should have a negative minor in the first figure, which involves illicit process of the major.

Section 825. The rules above given do not apply to the irregular sorites, except so far as that only one premiss can be particular and only one negative, which follows from the general rules of syllogism. But there is nothing to prevent any one premiss from being particular or any one premiss from being negative, as the subjoined examples will show. Both the instances chosen belong to the progressive order of sorites.

(1) Barbara.

All B is A.

All C is B.

All C is A.

All B is A.

All C is B.

Some C is D.

All D is E

∴ Some A is E

[Illustration]

(2) Disamis.

Some C is D.

All C is A.

Some A is D.

(3) Darii.

All D is E

Some A is D.

Some A is E.

(1) Barbara.

All B is C.

All A is B.

All A is C.

All A is B.

All B is C.

No D is C.

All E is D.

∴ No A is E.

[Illustration]

(2) Cesare.

No D is C.

All A is C.

∴ No A is D.

(3) Camestres.

All E is D.

No A is D.

∴ No A is E.

Section 826. A chain argument may be composed consisting of conjunctive instead of simple propositions. This is subject to the same laws as the simple sorites, to which it is immediately reducible.

Progressive.

If A is B, C is D.

If C is D, E is F.

If E is F, G is H.

∴ If A is B, G is H.

Regressive.

If E is F, G is H.

If C is D, E is F.

If A is B, C is D.

∴ If A is B, G is H.