understood by a logical demonstration may be seen in his *De generatione animalium*, Lib. II. cap. viii.

Logical presumption. A Wolffian term for synthetic reasoning, that is, induction and analogy; for hypothetic reasoning was not recognized as reasoning at all. The uniformity of nature is called the *principle of logical presumption.*

Logical division. Division into logical parts.

Logical distinctness. That distinctness which results from logical analysis.

Logical actuality. Kant, in the *Logik* by Jäsche (Einleitung, vii), defines logical actuality as conformity to the principle of sufficient reason, consisting of the cognition having reasons and having no false consequences; and he makes this, along with logical possibility, to constitute logical truth, which is thus used in its second sense. But in the *Critic of the Pure Reason*, in discussing the functions of judgments (1st ed., 75), he says that an assertoric proposition asserts logical actuality (Wirklichkeit, which Max Müller wrongly translates 'reality'), and makes this phrase synonymous with logical truth (which is thus used in its third, and proper, sense).

Logical definition. A strict definition by genus and specific difference. Ockham and his followers objected to the designation on the ground that the logician, as such, had no occasion to define any ordinary term, such as man (*Tractatus logices*, Pt. I. chap. xxvi). (C.S.P.)

Logical Diagram (or **Graph**): Ger. *logische Figur*; Fr. *diagramme logique*; Ital. *diagramma logico*. A diagram composed of dots, lines, &c., in which logical relations are signified by such spatial relations that the necessary consequences of these logical relations are at the same time signified, or can, at least, be made evident by transforming the diagram in certain ways which conventional 'rules' permit.

In order to form a system of graphs which shall represent ordinary syllogisms, it is only necessary to find spatial relations analogous to the relations expressed by the copula of inclusion and its negative and to the relation of negation. Now all the formal properties of the copula of inclusion are involved in the principle of identity and the *dictum de omni*. That is, if r is the relation of the subject of a universal affirmative to its predicate, then, whatever terms X, Y, Z may be,

Every X is r to an X; and

if every X is r to a Y, and every Y is r to a Z, every X is r to a Z. Now, it is easily proved by the logic of relatives, that to say that a relation r is subject to these two rules, implies neither more nor less than to say that there is a relation l, such that, whatever individuals A and B may be,

If nothing is in the relation l to A without being also in the same relation l to B, then A is in the relation r to B; and conversely, that,

If A is r to B, there is nothing that is l to A except what is l to B.

Consequently, in order to construct such a system of graphs, we must find some spatial relation by which it shall appear plain to the eye whether or not there is anything that is in that relation to one thing without being in that relation to the other. The popular Euler's diagrams fulfil one-half of this condition well by representing A as an oval inside the oval B. Then, l is the relation of being included within; and it is plain that nothing can be inside of A without being inside B. The relation of the copula is thus represented by the spatial relation of 'enclosing only what is enclosed by.' In order to represent the negation of the copula of inclusion (which, unlike that copula, asserts the existence of its subject), a dot may be drawn to represent some existing individual. In this case the subject and predicate ovals must be drawn to intersect each other, in order to avoid asserting too much. If an oval already exists cutting the space in which the dot is to be placed, the latter should be put on the line of that oval, to show that it is doubtful on which side it belongs; or, if an oval is to be drawn through the space where a dot is, it should be drawn through the dot; and it should further be remembered that if two dots lie on the boundaries of one compartment, there is nothing to prevent their being identical. The relation of negation here appears as 'entirely outside of.' For a later practical improvement see Venn, *Symbolic Logic*, chap. xi. (C.S.P.)

Logical Machine: Ger. *logische Machina*; Fr. *machine logique*; Ital. *macchine logistiche* (E.M.). An instrument devised to facilitate by mechanical means the handling of logical symbols or diagrams.

There are three such instruments which merit attention:—

(1) The first was constructed by W. Stanley Jevons in 1869 (announced in his *Substitution of Similars*, 1869, 60; described in *Philos.*

impressed upon the keys. He also had designs made by means of which the same operations could be accomplished by means of electro-magnets.

The characteristic of this machine lies in its simplicity, which may be the better appreciated as the machine is extended for problems involving more than four terms. For problems of ten terms Venn would require a new diagram of complicated form, and 1,024 keys to operate the instrument. Jevons for a ten-term machine would require 10,240 letters for his combinations, and a key-board with forty-four keys. Marquand's machine for ten terms needs only 124 letters and twenty-two keys.

There is a further difference between the machines. Jevons' presents as the conclusion not all the combinations consistent with the premises, but only those which involve the terms of the premises. For example, in a series of premises, he assumes that the only conclusion desired is the relation of the first to the last term in the series. In Venn's and Marquand's machines the inconsistent combinations only are thrown out, and all the combinations consistent with the premises are exhibited as the conclusion. Hence any term or combination of terms may be made the subject of the conclusion.

In 1883 Marquand published an account of a machine for producing syllogistic variations, which he constructed in 1881 (*Johns Hopkins University Studies in Logic*, 1883, 12–5). The two premises and the conclusion of a syllogism are written on three rectangular flaps, which are made so as to revolve on a horizontal axis. The contraposed forms of premises and conclusion are then written on the backs of the flaps. By turning a crank, the eight possible combinations of premises and conclusion are then exhibited to view.

This mechanism could be readily extended so as to exhibit similar variations for arguments involving a larger number of premises or conclusions. Marquand's logical machines are now in the Princeton Psychological Laboratory. (J.M.B.)

Logo-, &c. [Gr. λόγος, discourse, lore]: Ger. *Logo-*; Fr. *logo-*; Ital. *logo-*. Logo- (in combination) refers to the intellectual processes, and often specifically to the process introductory to speech. Thus logopathy has been used to indicate a disorder in the formation of thought for the purpose of speaking. On the other hand, logoneurosis is used as well to refer to general mental affections; while logorrhea refers to the excessive flow of words, a common symptom in cases of mania; and logomania to the form of mania in which this occurs. (J.J.)

Logomachy [Gr., taken from the First Epistle of Paul to Timothy, vi. 4 νοσῶν περὶ ζητήσεις καὶ λογομαχίας, doting about questions and strifes of words]: Ger. *Logomachie, Wortstreitigkeit*; Fr. *logomachie*; Ital. *contesa di parole*. A contention (in which it is not essential that two parties should be active) not professedly relating to the use of words and phrases, but in which proper care exercised to make the ideas clear will show the critic, either that there is no important difference between the position attacked and that defended, or if there is, that the argumentation does not relate to such points.

Theology and subjects connected with it, such as the freedom of the will, have been the great theatre of such war. At present it is still kept up in logic; and other branches of philosophy are not entirely freed from it. Disputes about the propriety of modes of speech, however hot and silly they may be, are not logomachy. (C.S.P.)

Logos [Gr.]: Ger. *Logos*; Fr. *Logos*; Ital. *Il verbo*. (1) Reason (q.v.).

(2) The eternal Son of God, in whom the wisdom and power of God are manifested, and who became incarnate in the person of the historic Jesus.

In Greek thought in its earlier stages the Logos is the universal or divine reason of the world. In later Greek thought under theosophic impulses the Logos acquired a quasi personality. It is hypostatized, at least in the thought of Philo of Alexandria, who ascribes to it some mediating functions between God and the world. The Christian idea of the Logos is contained in the prologue to the Gospel of St. John, in which it is identified with the eternal Christ, who became flesh in the person of Jesus Christ. Out of this germ the Christology of the early Church developed, and was embodied in the historic creeds.

Literature: Heinze, Die Lehre vom Logos in d. griechischen Philos. (1872); Zeller, Philos. d. Griechen, iii; Dorner, Hist. of the Devel. of the Doctrine of the Person of Christ. (A.T.O.)

Lombard, Peter. (cir. 1100–63 or 64.) Educated in theology at Bologna, Rheims, and (under Abelard) Paris. Taught theology successfully at Paris, and became bishop of Paris, 1159. For his work *Sententiarum Libri IV*, he received the title 'Magister Sententiarum.'

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