Summary of the course Elements of Logic
(1996/1997)

General Overview

This course provides a general educational introduction to classical logic, structured around individual examples and selected aspects that together make the entire field of logic comprehensible.

Starting from the basic framework of problem and solution and rooted in common sense, logic focuses on analyzing conditional sentences ("if, then") in which relationships within reality are expressed.

Logic rests on a solid ontological foundation - governed by the law of identity and the principle of sufficient reason- and gradually progresses from concept formation and the theory of definition to the theory of judgement and the theory of reasoning.

The texts explain hypothetical implication and the phenomenological method. The use of tropes, such as metaphors and metonymies, as well as the theory of order (harmology), is also presented as a structural element of traditional logic.

By precisely delineating concepts, analyzing judgements within their pragmatic and semantic contexts, and systematically examining forms of reasoning (such as deduction, reduction and induction), the course provides a clear method for a reasoned search for truth.

Summary

1: Starting Points, Method and Common Sense

The course approaches logic through the ancient term *stoicheia* (elements): individual aspects or selected examples that are examined step by step until the coherence of the entire system becomes visible. Thinking is rooted in a general framework of problem and solution. A problem consists of the given (that which immediately presents itself as a phenomenon) and the question to be answered (that which must be demonstrated); the solution consists of a series of short, illuminating texts.

The course is intended neither as a superficial pastime nor as narrowly focused hyperspecializing. Instead, it offers a general educational introduction in the tradition of the Harvard Principle, intended to prevent professional narrow-mindedness. If philosophy is the methodical and reasoned search for truth, logic constitutes the applied method for this search.

The laws of logic are essentially the orderly elaboration of common sense (*sens commun* or *sofrosunè*), which is present in every human being as a

fundamental insight, as opposed to an aberrant or impaired intellect (*parafrosunè*).

The formal object of logic is the conditional sentence ("if antecedent, then consequent"), in which an antecedent or condition leads to a consequent or inference. This regulatory model has applications in both mathematics and everyday life.

A distinction is made between direct knowledge (describing what immediately presents itself as a phenomenon) and indirect or mediate knowledge (demonstrating something by means of reasoning). Aristotle distinguished various signs and their evidential force: the unambiguous sign (*tekmèrion*), the ambiguous sign (*sèmeion*) and the rule with exceptions (*eikos*).

To represent the given accurately, the course employs Husserl's phenomenological method, which uses phenomenological reduction (eliminating what is irrelevant) and eidetic reduction (focusing on the general concept or *eidos*).

2: The Ontological Foundation of Logic

Logic is not a self-contained formal game but is fundamentally grounded in ontology, or the theory of reality (*ontologia*). Ontology considers everything insofar as it is 'something' or a 'being', and defines reality as "everything that is not nothing and is therefore something". This includes not only physical things but also dreams, utopias and science fiction as distinct types of being.

Two fundamental axioms govern Aristotelian logic and ontology:

- *The Law of Identity:* "Whatever is (so) is (so)." This recognizes a being as identical with itself (A is A), forming the basis of the principle of non-contradiction (something cannot simultaneously be itself and something else) and the principle of the excluded middle. Every being exhibits existence (actual existence) and essence (mode of being).
- *The Principle of Sufficient Reason or Ground:* "Whatever is (so) is (so) for a reason or ground (*archè*), within itself or outside itself." This axiom makes explanation and conceptual reasoning possible.

Alongside reflexive identity (the identity of something with itself), harmological ontology, or the theory of order, distinguishes ways of ordering reality on the basis of partial identity (analogy) or non-identity.

Tropes play an important role here: metaphor (partial identity based on similarity within a set) and metonymy (partial identity based on relationships within a framework or system). This theory of tropes culminates in synecdoche and scientific induction (generalization ('veralgemening') across sets versus 'wholization' ('veralgeheling') across entire systems). Through combinatorics and differentials, data are organized into configurations, leading to the theory of unity (*henology*).

3: The Theory of Concepts and Techniques of Definition

A concept is the presence of a reality in the mind and is expressed linguistically through a term. Logic preferably works with clearly delineated, defined concepts. Every concept has two components:

- *the intension of a concept* (*comprehensio*, the totality of its characteristics) and
- *the extension of a concept* (*extensio*, the domain of applicable cases). The richer the intension, the narrower the extension. Extensions may be singular (unique), collective (a system) or distributive (a set).

Concepts are organized through classification (of their extension) and definition (of their intension). Aristotle and Porphyry explained how a concept can be approached through:

The five predicables: essential property (*idion*), accidental property (*sumbebèkos*), genus (*genos*), specific difference (*diafora eidopoios*) and species (*eidos*).

The categories: substance (*ousia* or substance) and relations or additional aspects (quantity, quality, place, time, action, affection, situs and habitus).

In defining, Lahr distinguishes between nominal (provisional, linguistic) and real (complete, substantive) definitions. In addition to semiotic definitions (descriptive, analytical, stipulative and contextual), there are non-semiotic and praxeological definitions. A praxeological definition describes the essence of a phenomenon through a fixed sequence of actions or an algorithm, as in a recipe or calculation. Logic also recognizes cumulative definitions (in which proofs or indices converge towards the truth) and legal definitions.

4: The Theory of Judgement and Contextual Semantics

A judgement consists of assigning a predicate (model or predicative element) to a subject (original and subject), traditionally structured from a nominal component (*onoma*) and a verbal component (*rhèma*). Every judgement is essentially based on a comparison between subject and predicate.

Judgements are analyzed according to:

- *Quantity:* singular, particular or universal.
- *Quality:* affirmative, negative or restrictive (qualified).

In negation, several forms of opposition are distinguished: correlative, contrary, privative and contradictory. A contradictory statement leads to an absurdity (such as the "square circle"), which is internally inconsistent and refers to absolute nothingness.

From a semiotic perspective, the utterance of a judgement (a speech act) has three foundations:

- *Syntactic:* the correct combination of the parts of a sentence according to grammatical rules.
- *Semantic:* correspondence with the surrounding reality on the basis of the law of identity.
- *Pragmatic:* the intention or purpose pursued by the speaker in making the judgement.

Leibniz divided judgements into analytic judgements (justifiable by analyzing the definition of the subject) and synthetic judgements (justifiable by testing beyond the terms through empirical samples). Furthermore, the text of a judgement constitutes a quasi-open system whose correct meaning is partly determined by context and by what remains unsaid (*le non-dit*).

5: The Theory of Reasoning, Syllogistics and Induction

The theory of reasoning deals with complete propositions in conditional form. Arguments are divided into:

- *Immediate inferences:* direct conclusions drawn from two sentences on the basis of an unstated axiom (as in the logical square, the conversion of judgements or a fortiori reasoning).
- *Mediate inferences* (syllogisms): arguments involving three terms in which the sufficient reason is explicitly formulated.

Since Plato, two fundamental types of reasoning have been distinguished:

- *Deduction* (*sunthesis*): "If A, then B. Now, A. Therefore, necessarily B." Reasoning proceeds from the general to the particular; the conclusion is necessary.
- *Reduction* (*analusis*): "If A, then B. Now, B. Therefore, A." The conclusion is not necessary and is regarded as a hypothesis.

Peirce developed this distinction further by differentiating between induction (generalization to all elements of a set) and hypothesis ('wholization' to the system as a whole).

Of the 256 possible combinations of syllogisms (divided into 4 figures and 64 moods), only 19 are valid. Euler visualized the relationships between extensions within syllogisms using spatial circle diagrams.

Besides the ordinary syllogism, there are special forms, such as the polysyllogism, the sorites (chain reasoning), the epicheirema (with an embedded proof), the dilemma, the argument from authority, the reductio ad absurdum (Popper's falsification) and lemma-based analytical reasoning. In the latter, one starts from an assumed lemma (a hypothesis 'X'), which is tested against reality through sampling and analysis.