ВІСНИК
КИЇВСЬКОГО НАЦІОНАЛЬНОГО УНІВЕРСИТЕТУ ІМЕНІ ТАРАСА ШЕВЧЕНКА

ФІЛОСОФІЯ 2(2)/2017

Засновано 1958 року

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A special purpose of the journal is to publish the results of research scientists of Taras Shevchenko National University of Kyiv and its academic partners in the field of philosophy.

Published four times per year.

Адреса редколегії	**01033, Київ-33, вул. Володимирська, 60, філософський факультет ☎ (38044) 239 32 81**
Затверджено	**Вченою радою філософського факультету 27.06.17 (протокол № 11)**
Зареєстровано	**Міністерством юстиції України. Свідоцтво про державну реєстрацію КВ № 22071–11971Р від 20.05.2016 р.**
Засновник та видавець	**Київський національний університет імені Тараса Шевченка, Видавничо-поліграфічний центр "Київський університет" Свідоцтво внесено до Державного реєстру ДК № 1103 від 31.10.02**
Адреса видавця	**01601, Київ-601, б-р Т. Шевченка, 14, кімн. 43; ☎ (38044) 239 32 22; факс 239 31 28**

Інтернет-сторінка журналу: http://jphilos-univ.kiev.ua

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ARISTOTLE AND INFORMAL LOGIC (TO THE CELEBRATE 2400 ANNIVERSARY OF ARISTOTLE)

In the article, the correlation between the logical doctrine of Aristotle and modern informal logic is analyzed.
Keywords: Aristotle, Informal logic, Logics.

2016 year UNESCO declared the "year of Aristotle". The proposal to celebrate 2400 anniversary of Stagirite was presented by the National Commission for UNESCO of Greece with the approval of the "International Centre for Research Aristotle" of Aristotle University of Thessaloniki.

Based and formed logic of Aristotle, as a way to protect the truth and expose the sophistry is relevant for more than two millennia. Despite the fact that was and is intensively developing modern logic – creation of Stagirite is an indispensable and increasingly in demand. As well as two thousand years people ago continues to argue, refute, convince, argue, with the use of natural language.

And when through thickness of centuries in front of the leaders of the "movement of informal logic" Ralph Johnson and Anthony Blair got a question: what is the interest in the natural (it is the same), for informal logic, then they in the preface to the "Proceedings of the First International Symposium on informal logic" (Canada, 1980) stated a very simple reason – "the time has come".

Finalized in the first half of the twentieth century, modern logic, is used as a method of studying mental processes, artificial, formalized languages, develops the deductive reasoning (in the sense of calculus) are used exclusively in mathematics and mathematicised branches of the natural sciences.

Such logic owes its appearance to the works of the greatest logicians of the twentieth century: *Frege, Russell, Whitehead, Hilbert, Tarski, and Carnap*. Moreover, her something fully be calling "formal": in the sense, she is not requiring a live discourse, in the sense of not contributing to contemporary man (real individuals) to acquire the skills that will help him in his every day, normal life in the fields of science, business, politics, practice of law etc.

Emergence of informal logic *G. Ceyhan* (is one of its supporters) explains so: "*Today's students require a "marriage" between theory and practice. They argue that the introduction courses of logic and rhetoric not even in their interest*" [2].

In addition referred earlier Ralph Johnson says bluntly that "being teacher of formal and deductive logic, I realized that it is not the best suited to the analysis of political discourse."

One can cite such statements and other representatives of contemporary informal logic such as *Stephen Toulmin*, *Gabriel Tarde* and others.

However from the height of the centuries it must be concluded that, indeed – "*a new, in its origins, it is always – well forgotten old*".

That is what they say in their treatises *R. Johnson, E. Blair, S. Toulmin, G. Tarde* and others, we can find in Aristotle's heritage.

A direct proof of this is that themselves the representative's informal logic perceive its origins in Aristotle's logic, particularly in his treatise "*On sophistical refutations*".

This is because one of the central concepts of informal logic is the notion of "*fallacy*". Moreover, as you know – the main task of informal logic is a description and systematization of errors in real discourse, real (in the sense of ordinary discourse) outside the logical calculus.

Namely, in the treatise "*On sophistical refutations*" Aristotle describes, classifies the logical errors (fallacy), paradoxes, reasoning techniques that lead the interlocutor or audience to confusion – with the aim of identifying and overcoming.

It is this theme became obligatory section in training courses on logic since the Middle Ages. Beginning this tradition put in the thirteenth century, a teacher from the University of Oxford, *Edmund Rich* (also known as *Edmund of Abingdon*).

Aristotle's conception of logic as a means of protection against fallacy and errors through the centuries has actively supported *William Minto*.

Analyzing of deductive and inductive logics, he concludes: "*the basis of all these exercises, is the same desire to avoid confusion and prevent the mind from error*" [1]. This, for W. Minto, is the practical character of logic.

Everything has just given evidence suggests that Aristotle's main concern was to create a logic, which would be taught to construct evidence, denials, hypotheses, draw analogies, find and fix errors in their own and other considerations i.e. to shape a culture of thinking, or logical culture. It is thanks to the implementation of this goal logic from its inception – it is a full-fledged section of the spiritual culture of humanity.

To more clearly to understand the communication between the ages by Aristotle and the modern state of natural logic to need seek help from Clio, the goddess of history.

A special place among the works of Aristotle takes "*Topics*". Being the earliest product of the logic of "*Topics*", it is an extensive treatise on the probable evidences and of the dialectic as a method of such proofs.

The subject of analysis in this treatise are logical arguments that are in the output is not significant, but only probable knowledge. The subject of analysis in this treatise are logical arguments, which contain in derivation is not significant, but only probable knowledge. Such arguments are premises on a probability value.

Despite the fact that such arguments are constructed in accordance with the rules of logic, but because of the likely nature of the premises, they certainly do not need to lead to true conclusions.

Such arguments Aristotle named unprovable. It should be borne in mind that Aristotle understands the truth as satisfaction of our knowledge of reality.

At the same time, provable arguments, in his opinion, are considered only those in which the premises are necessary to the true position. That is the conclusion of such reasoning, in strict compliance with the rules of logic, it will always be true.

Such an understanding of essence of the logical reasoning of Aristotle, primarily because his in his original research on the logic guided entirely on rhetoric and jurisprudence.

By analyzing the rhetoric and jurisprudence, Aristotle set himself the task to reveal the laws governing the dispute. Therefore, his research enthusiasm for research was focused on the laws of thought, having a universal nature.

Compliance with these rules must be present in the types of dispute in which endeavor to reach the truth, namely, in the dialectical debate. Identify these provisions is possible only by abstracting them from the language support of our thoughts.

Prove or analytical reasonings Aristotle dedicates "*Analytica Priora*" and "*Analytica Posteriora*". In "*Analytica Priora*" analyzes Aristotle syllogism, and in "*Analytica Posteriora*" the doctrine of proof.

It is in the "*Analytica Priora*" and "*Analytica Posteriora*" as the main treatises of logic of Stagirite, the logic executed in an independent philosophical discipline, whose main goal, the achievement is not probably truths, but necessary truths.

Understanding the science of logic as the means of obtaining the necessary truth necessarily involves the development of the demarcation criterion of truth and falsehood. This criterion, according to Aristotle, must necessarily have such feature as "evidence."

Hence the "truth" – this is compliance approval or denial of reality, and the "false" – a discrepancy.

Substantiate by way of evidence of the truth or falsehood of any proposition – then refer to those arguments by which the denial of this provision would become impossible, and the determination of its truth would be necessary.

Proof as a kind of justification, according to Aristotle, can be viewed in two ways:

A) proof in an absolute sense;
and
B) proof in a relative sense.

If in the process of justification of compliance with the thought of reality, a subject belonging to a subject is disclosed as required, the proof on the person in the absolute sense, which gives the thesis to be proved a sign of authenticity, irrefutable based on logical necessity.

If in the process of justification of conformity of thought actually was not disclosed as a necessary, we have the proof in a relative sense, ie, aimed at obtaining a probable knowledge. Such a proof is called dialectics, having to obtain not truth itself, as the line of thought of reality, and the lack of identification of the contradiction between subject and predicate in the judgment, as well as between the positions representing the side in the argument.

The proof is in the relative sense, the thesis gives a sign of probable knowledge (i.e. the knowledge allowing negation). This determines the nature of the relative evidence as a of the dialectical discourse no employed strict statement of indisputable truths, and methodological research conditions for obtaining probable (plausible) knowledge.

The logical basis of relative evidence, according to Aristotle, there is a way of reasoning from a single, particular to the general, which (method) allows the target, bring the mind to the necessary and universal truths. This way of reasoning in logic is called induction.

If the main task of deduction to elevate the knowledge gained to the level of genuine evidence-based science, intuition sets up our minds to the possibility of acquiring knowledge, to raise the question of the fact of the existence of things and phenomena, the laws of their existence.

During the discourse, we can get not only reliable, but also probable knowledge. Likely knowledge, as a rule, is the result of sophistical arguments. Therefore, to test reliability using procedure of refutation to test this value to true. In this sense, refutation as kind of the argumentation is proof.

Since the focus of the reasoning in the induction, according to Aristotle, is aimed at getting unfinished, incomplete and, in this sense, a possible knowledge, the induction, to a large extent, is a heuristic method of reasoning, which is based not immutable initial start, and a reference to the undiscovered, unknown.

In the analysis of inductive conclusion is required from the outset to dissociate themselves from those interpretations of inductive conclusion, which gather up for centuries of history of science and logic, which largely distort the true nature and purpose of induction.

In the history of logic the induction usually defined as conclusion by which in a conclusion is obtained new, expanded knowledge, compared with premise. Induction proclaimed progressive, revolutionary method of cognition, which is able to replace the Aristotelian, scholastic, dogmatic logic on the logic of discovery.

According to *F. Bacon*, and then *JS Mill's* the induction is able to discover the causes of the things around us, and the world at large.

The monographs and textbooks of the twentieth century the appearance of the induction was associated with the emergence of commodity production, which is determined by the development of the experimental sciences.

Although in reality the induction as a method of reasoning it was already known in the time of Socrates, Democritus, Aristotle.

In textbooks on logic, in reference literature the induction is usually defined as conclusion, in which the transition from a single, specific to the total in the form of axioms, postulates, laws. And thus, the induction reflects the real process of cognition, the genesis of knowledge in general.

Isolation of a single, separate, concrete – this is a generalization. In the real process of cognition the appearance, formation of knowledge takes place completely different way. And, most importantly, beyond logic.

In front of logic are completely different tasks. The main purpose of logic – to investigate the movement, the operation of knowledge that emerged during the cognitive process.

Given the given the comments the induction should be understood as a conclusion, in which between the premises and the conclusion there is a ratio of confirmation. This means that, at the conclusion of an inductive inference has the character of a hypothesis. That hypothetical conclusion of an inductive inference leads to the fact that the logical nature of induction presented the concept of probability.

The probability – a characteristic of the degree of the possible occurrence of an event in a particular setting.

Or, in other words, the probability – is favorable ratio for all possible cases. For example, the probability that in tossing a coin will fall "eagle" is 1: 2, and the loss of a particular facet dice – 1: 0.

These examples of probability represent the so-called objective probability. The objective probability is a quantitative measure of the probability of the possibility of occurrence of an event under certain conditions. Since the objective probability may explore means of mathematics, then her called a mathematical probability.

In addition to the objective probability there is subjective. Subjective probability is to be understood as

a measure of subjective confidence, which is associated with psychological characteristics of human intuition, common sense.

In modern logic, there is a whole new trend, called probabilistic logic. His goal – to investigate the statements, which may be in addition to the absolute values of "true" and "false" has intermediate values that capture the probabilistic nature of the statements of values, their degree of credibility, the degree of their confirmation.

This allows us to consider the induction near the deduction as one of the effective means of argumentation and, thereby, distinguished from those unskilled mating induction, which took place in the history of logic.

For Aristotle, the nature of induction and deduction, about their relationship and communication was not in the same plane as imagined some commentators and interpreters of his teaching.

Considering the evidence as one of fundamental of logical means of argumentation, Aristotle was occupied by the question of the role of induction in determining the initial beginnings of all the evidence.

Since any evidence based on some initial principles, which are obtained by outputting of the preceding principles, the question naturally arises about the existence of unprovable beginnings.

When comparing the induction and deduction as methods of reasoning, we see that that there is the initial in deduction is a consequence of induction (meaning according to the degree of generality and descriptiveness). Such an understanding of induction and deduction allows you to see the original beginning of the proof, not as something immobile, frozen, as well as the volatile, requiring the completion of the contained plaque of heuristic.

In this regard, Aristotle distinguishes three kinds of unprovable beginnings:

– *Axiom;*
– *Assumptions;*
– *Postulates.*

Each of these initial beginnings performs peculiar only to his function.

Axioms determined opportunity to the true significance.

Assumptions are the bases, which in themselves are provable, but within a particular argument accepted without proof.

Finally, postulates – are positions, the truth of which was adopted by agreement.

Because of this nature of the initial beginnings, we get in reasoning knowledge, which on the form is universal and necessary. That versatility and compulsiveness of decision of conclusion in reasoning is held of form.

However when you consider that a form was associated with of "common", "unchanged", "casual ", it can be assumed that in the works of Stagirite was his understanding form. For Aristotle the form coincides with the nature of object from the point of view of ontology and, from the point epistemology, the form serves as the conceptual definition of the essence.

So the notion of form has allowed Aristotle to see it synthesizes beginning, which discover in the meanings similar with all the differences their (thoughts) of objects and contents.

In his logic, Aristotle establishes a hierarchy of forms, where the main form is a judgment. Each judgment contains an affirmation or negation. It is because of the affirmation and negation of the same about this subject generated possible value judgments ("true", "false").

Comparison of different content judgments on the basis of their significances inevitably leads to the relation of logical consequence, a form which has of a syllogism. Because of this form, it becomes possible in the process of withdrawal stable (invariant) from of changeable (variable). In other words, the form as conclusion appears as a logical constant, which is clearly distinguishable from the logical variables. Aristotle first to introduce a special notation for the logical constants and logical variables. Logical constants it represents the words of natural language ("...common to all...", "...is not common to all...", "...has some...", "...is not inherent to some...") and logical variables denoted by the Greek letters A, B, Г.

Because of the interaction of logical constants and logical variables, the judgment is characterized by the need of its content and universality its application, that in strict compliance of laws of thought allows produces in the reasoning necessary true conclusion.

Aristotle singled out in its logic of the law of contradiction and the law of the excluded middle as the predominating. Law of identity and sufficient reason implicitly presents in Stagirite reasoning's.

In the literature on logic, tend to indicate that modern logic is clarified Aristotelian laws and proposed logical laws called tautological. Their endless. Those, get some logical chaos.

It should be borne in mind that the laws of identity, contradiction, excluded middle, sufficient reason are methodological principles, regulatory requirements, which are based our arguments, finally, which ensures consistency, consistency and validity of our arguments.

Neglecting these preventions in textbooks on logic, laws of Aristotle are whitening in the form of the following formulas:

The law of identity	– A=A або A⊃A;
The law of contradiction	– A∧Ā;
The law of excluded middle	– A∨Ā;
The law of sufficient reason	– A⊃A;

This entry laws in the form of formulas is very conditional transfers their essence. For example, if we say that the law of the excluded middle – a formula A ∨ Ā – it is, in fact, almost nothing to say. After all, the law of excluded middle – a methodological principle, which has a number of requirements to the process of reasoning and to reduce it to a communication meaningless logical terms (disjunction and negation), which appear in the formula of the law will be far from reality.

For the benefit of whitening laws in the form of formulas, given an opinion that the formulas A⊃Ā; A∨Ā; A∩Ā – it is always true propositions in the classical logic. In addition, always-true proposition in classical logic called the law. This view can be disproving when writing the law of sufficient reason in the form of a formula. The formula A⊃B it not always true, respectively, and it is not logical law. It can be saying that the failure to present the law of sufficient reason as the formula was a kind of proof that the basic formal-logical laws (or laws of logic) have a very different nature than always-true formulas, and perform an original function in the process of construction and analysis of our reasoning

Recording the laws of logic in the form of formulas and the conviction – that it's a great achievement of modern logic, which, on the one hand, impoverishes the essence and purpose of these laws and on the other – does not account for the true purpose and possibilities of modern logic as an effective tool for research and study of scientific knowledge.

It should be stressed once again that the universally valid formulas or a tautology – this is the schemes of constructing arguments that are abstracted from the

content and reasonings, which are not determined significances peculiar reasonings. This feature of the logical laws (i.e. tautologies) allows you to use them to calculate the accuracy of any reasoning, regardless of its content. Moreover, where the evidence, psychological orientation, intuitive relevance, practicality are bad assistants, comes to the aid formalism, which allows you to test our reasonings and to separate right from wrong reasoning.

Assessing the logic of Aristotle from the height of today, it is quite legitimate to say that it (the logic) is a practical discipline. For Aristotle in the creation of logic as a natural or a practical discipline contributed significantly to the humanitarian and social climate of ancient Greece. The ancient Greeks were excellent practices in logic.

For a free Greek it was prestigious to have developed the skills of analysis, the organization of knowledge, reasoning strategies. This means that the logic of Aristotle had as its primary source of the need of the ancient Greeks in the art of oratory.

As a form of reflection on the rules of mental activity, logic requires a large amount of the output material, argumentative nature.

We know that not every type of discourse provokes logical research. It is in the argument, according to Aristotle, is revealed the applied aspect of the logic as the theoretical discipline. New research on the theory of argumentation shows the role and place of theoretical calculations of logic in argumentative discourse.

In the spirit of Aristotelian logic, the argumentation define as a form of intellectual activity, during which formed the belief in the truth or falsity of any situation, and is determined its assessment and the feasibility of both for the author and for the person or audience.

The argumentation is multidimensional and multi-component creation of human intellectual activity, which rests on the acquisition of logic, philosophy, psychology, linguistics, rhetoric, ethics, culture, intuition, common sense etc. Of all these components, which make up argumentation should allocate logic.

In all sciences, in all spheres of human activity used such concepts and procedures, as truth, acknowledgment, consequently, apodicticity, proof, refutation, interpretation, explanation, verification, but only in the logic determined the nature of these concepts and procedures, only in the logic is analyzing of their features, the structure and rules.

Component, which is the logic in the argumentation, is a rationale. **Rationale – is the transition from a fragment of knowledge of both the original (base) to the following fragment of knowledge as a consequence**. Determine of rationale as procedure can be as follows: "*rationale – a means of transferring of logic of such characteristics of a reason as the truth, apodicticity, reliability, etc. to substantiating*".

It should be borne in mind that there is not some universal justification procedure. Justification is realizing through its types of evidence, refutation, explanation, prediction, and interpretation of their multiple modifications. So rationale – it is only an abstraction from its specific listed species. Each kind of rationale gives substantiating appropriate response: proof-veracity, explanation-apodicticity, interpretation-representation.

This base, which is associated with the substantiating – it is not only the knowledge that the truth is not in doubt, but it is also appropriate rules to ensure that the specific form of rationale (proof, explanation, etc.), and conditional on the transfer of the relevant characteristics of a reason on substantiating.

Sometimes in textbooks and monographs the concepts argumentation, reasoning, proof, refutation is considering as identical. However, in fact each of these concepts represents the various processes and procedures. From the just determination, it shows that the rationale cannot be identifying with the argumentation, because it (rationale) is a component that only part of the argumentation, which is responsible for logic.

Proof and refutation of the same cannot be identifying with the argumentation. The fact that the proof and refutation are important parts of the argumentation, but do not exhaust its content. Once again emphasizing the fact that in the course of argumentation not only prove thesis or disprove antithesis, but also form a belief in the truth of thesis or falsity of antithesis.

Consequently, all the new trends of modern logic ideologically date back to Aristotle. This gives reason to talk about Aristotle as our contemporaries, who is invisibly present in all the achievements of today's logic as science.

Список використаних джерел:

1. Минто В. Дедуктивная и индуктивная логика. – М., 1909. – С.18.
2. Kahane H. Logic and Contemporary Retoric. Belmont, Calif., 1971. – p.23.

References:

1. Minto V. Deduktivnaya I induktivnaya logika. – M., 1909. – P.18.
2. Kahane H. Logic and Contemporary Retoric. Belmont, Calif., 1971. – p.23.

Received Editorial Board 10.04.17

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АРІСТОТЕЛЬ ТА НЕФОРМАЛЬНА ЛОГІКА (ДО 2400-Ї РІЧНИЦІ АРІСТОТЕЛЯ)

У статті аналізується кореляція між логічним вченням Арістотеля та сучасною неформальною логікою.
Ключові слова: Арістотель, неформальна логіка, логіка.

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АРИСТОТЕЛЬ И НЕФОРМАЛЬНАЯ ЛОГИКА (К 2400-летию АРИСТОТЕЛЯ)

В статье анализируется взаимосвязь между логической доктриной Аристотеля и современной неформальной логикой.
Ключевые слова: Аристотель, Неформальная логика, Логика.

UDC 16

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JAAKKO HINTIKKA'S CONTRIBUTION TO MODAL LOGIC IN HIS EARLY WORK

This article is dedicated to analyzing Jaakko Hintikka's contribution to modal logic in his early work.
Keywords: Jaakko Hintikka, modal logic, history of logic.

Constituents and distributive normal forms

Hintikka learned about constituents and distributive normal forms from the lectures of his teacher, G. H. von Wright. The lectures took place at the University of Helsinki during 1947-1948. We fix a monadic first-order language. From the primitive predicate symbols of the language, one can generate mutually exclusive predicates (*Q*-predicates) in an obvious way. Thus if we assume that the language possesses only two monadic predicates, M_1 and M_2, we get 4 *Q*-predicates

$Q_1(x) = M_1(x) \wedge M_2(x)$
$Q_2(x) = M_1(x) \wedge \neg M_2(x)$
$Q_3(x) = \neg M_1(x) \wedge M_2(x)$
$Q_4(x) = \neg M_1(x) \wedge \neg M_2(x)$.

A *constituent* tells us which *Q*-predicates are instantiated and which ones are empty in an underlying universe of individuals. Thus the logical form of a constituent (with quantifier depth 1) is:

$C = \pm\exists x Q_1(x) \wedge \ldots. \wedge \pm\exists x Q_4(x)$

Constituents are mutually exclusive and each constituent specifies a "possible world". The disjunction of all constituents is called by von Wright a tautology, which, when presented in this way, is said to be in distributive normal form. Von Wright will later on apply constituents to the study of modal logic (von Wright 1951).

Hintikka, 21 years old, set himself the task to extend distributive normal forms to the entire first-order logic with relation symbols. The project resulted in his doctoral dissertation, *Distributive Normal Forms in the Calculus of Predicates*, Hintikka (1953), where Hintikka showed, among other things, that each formula in first-order logic is equivalent to a disjunction of (canonical) constituents. In the particular case in which the sentence is a consistent generalization (quantificational sentence without individual constants), Hintikka showed that it can be expressed as a finite disjunction of constituents (each generalization has a finite quantificational depth.) Hintikka's results are better known to the community from Hintikka (1964).

Constituents and distributive normal forms became the methodological pillar of what later on came to be known as Hintikka's school in inductive logic and philosophy of science, which involved, in addition to Hintikka himself, his students R. Tuomela, R. Hilpinen and I. Niiniluoto. Beginning with (1955), Hintikka developed the tool of model sets and applied them to alethic and epistemic logic. We will survey some of the main results in comparison to similar treatments by G. H. von Wright, Stig Kanger, and Saul Kripke.

Model sets

In Hintikka (1955) the author introduced models sets as a new tool in logical semantics, and constructed a new proof of the completeness of first-order logic. A model set is a set of sentences in the relevant logical language which constitutes a partial description of a possible state of affairs.

One starts with a first-order language *L* and assumes it has an infinite number of individual constants (actually Hintikka did not use the expression "individual constants, but what he called "free individual variables" or sometimes "free individual symbols". However, Hintikka often emphasizes that free individual variables cover names and other singular terms which purport to refer to well defined objects; see e.g. Knowledge and Belief, p.93.) A model set μ is any set of sentences of *L* which satisfies some very intuitive closure conditions:

(i) For any atomic sentence *A*, not both $A \in \mu$ and $\neg A \in \mu$
(ii) If $A \wedge B \in \mu$, then both $A \in \mu$ and $B \in \mu$
(iii) If $A \vee B \in \mu$, then either $A \in \mu$ or $B \in \mu$
(iv) If $\neg\neg A \in \mu$, then $A \in \mu$.
(v) If $\neg(A \wedge B) \in \mu$; then $\neg A \in \mu$ or $\neg B \in \mu$
(vi) If $\neg (A \vee B) \in \mu$; then $\neg A \in \mu$ and $\neg B \in \mu$

The clauses for quantifiers introduce further complications:

(C.E) If $\exists x A \in \mu$, then $A(x/b) \in \mu$ for at least one constant *b* of *L*

(C.U) If $\forall x A \in \mu$, and if *b* occurs in at least one member of μ, the $A(x/b) \in \mu$.

(C. ¬E) If $\neg\exists x A \in \mu$, then $\forall x \neg A \in \mu$.

(C. ¬U) If $\neg\forall x A \in \mu$, then $\exists x \neg A \in \mu$.

Identity requires additional rules:

(C.=) If *A* is an atomic formula or its negation, and $A \in \mu$ and if *B* is exactly like *A* except that *a* and *b* have been interchanged in one or several places,

then $B \in \mu$.

(C.self≠) For no constant *b*: $b \neq b \in \mu$.

Sometimes Hintikka prefers the following rule to (C.self≠):

(C.self=) If *b* occurs in the formulas of μ, then $b = b \in \mu$.

Hintikka's purpose in studying the notion of model set is expressed in the following passage:

The basic notion of a semantic theory is normally the notion of truth. In so far as we are not interested in truth under some *particular* interpretation of of logical formulae but rather in the question of whether there are *any* interpretations which make a give set of formulae true (in short, if we are not interested in any one interpretation more than in the others), the basic concept of a semantical theory may also be chosen to be that of *satisfiability*. If the negation of a formula A is not satisfiable, A is said to be valid. (Hintikka, 1961, p. 119.)

Hintikka defines the notion of satisfiability by reference to the Carnapian notion of state-description:

- A set of formulae λ is satisfiable if and only if there is a state description in which all the members of λ are true.

For a single sentence *A* we say that *A* is satisfiable if and only if {*A*} is satisfiable. Thus a sentence is satisfiable if and only if A is true in a state description.

A state description, the ancestor of the notion of model set, is a set of formulae which satisfies the following conditions:

(C.1) If *A* is an atomic sentence (or an identity) then not both $A \in \mu$ and $\neg A \in \mu$

(C.2) If *A* is an atomic sentence (or an identity) then either $A \in \mu$ or $\neg A \in \mu$

(C.3) If *A* is an atomic sentence (or an identity) or the negation of an atomic sentence (identity), and if $A \in \mu$ and

$a = b \in \mu$ and if B is exactly like A except that a and b have been interchanged in one or several places, then B $\in \mu$.

(C.4) Not $\neg(b = b) \in \mu$.

Thus essentially, state-description is a set of atomic sentences or their negations. In order to understand the above definition of satisfiability, we still need to understand the notion "a state description makes all the members of λ true". One way to proceed, following Hintikka (1961), is to give necessary and suffficient conditions for a set of sentences μ to be the set of *all* sentences which are true in a state description. The set of conditions includes, in addition to (C.1)-(C.4) the following:

(C.5) If $A \wedge B \in \mu$, then both $A \in \mu$ and $B \in \mu$.

(C.6) If both $A \in \mu$ and $B \in \mu$, then $A \wedge B \in \mu$.

(C.7) If $A \vee B \in \mu$, then either $A \in \mu$ or $B \in \mu$.

(C.8) If either $A \in \mu$ or $B \in \mu$ and all the individual constants occurring in $(A \vee B)$ occur in the other formulae of μ, then $A \vee B \in \mu$.

(C.9) If $\exists xA \in \mu$, then $A(x/b) \in \mu$ for at least one constant b

(C.10) If $A(x/b) \in \mu$ for at least one constant b, then $\exists xA \in \mu$.

(C.11) If $\forall xA \in \mu$, and if b occurs in at least one member of μ, then $A(x/b) \in \mu$.

(C.12) If $A(x/b) \in \mu$ for every individual constant b which occurs in the formulae of μ, then $\forall xA \in \mu$.

Thus conditions (C.1)-(C.4) make sure that μ is a state-description, and the other conditions constitute a recursive definition of what it is for a non-atomic sentence to be true in a state description. The clauses for negation are missing, because it is assumed that negation occurs only infront ot atomic sentenced. But if this assumption were dropped, they could be easily added, e.g.

(C.13) If $\neg(A \wedge B) \in \mu$, then either $\neg A \in \mu$ or $\neg B \in \mu$.

(C.14) If either $\neg A \in \mu$ or $\neg B \in \mu$, then $\neg(A \wedge B) \in \mu$, etc.

We shall disregard them in what follows.

Now we return to the above definition of satisfiability of a set of sentences (or formulae) and reformulate it, following Hintikka, as:

- A set of formulae λ is satisfiable if and only if λ can be embedded in a set which satisfies conditions (C.1)-(C.12).

One of Hintikka's basic insights in his early work is the observation that the right-to-left conditions are redundant for his purpose, and among those, condition (C.2) is also redundant. He ends up only with the left-to-right conditions (C.1), (C.3), (C.4), (C.5), (C.7), (C.9) and (C.11) and calls any set which satisfies them a *model-set*. Indeed, we notice that they (together with similar left-to-right conditions for negation) constitute his definition of a model set at the beginning of this section. (Hintikka, 1961.)

Hintikka is then able to prove that a set of formulae is satisfiable if and only if it can be embedded in a model set.

He expresses informally this result in the following way:

The result may perhaps be expressed intuitively by saying that a model set is the formal counterpart of a possible state of affairs (of a 'possible world'.) (It is, however, large enough a description to make sure that the state of affairs in question is really possible.) For it is natural to say that a set of sentences is satisfiable if it can be embedded in a (partial or exhaustive) description of possible states of affairs; and this is just what we demonstrated if model sets are interpreted as such descriptions. (Hintikka, 1961, p. 122.)

Later on Hintikka will extend the notion of satisfiability (consistency) to sets of sentences which contain modal operators. Before describing his ideas, let us look at the work on modalities done by Hintikka's teacher, G. H. von Wright.

Von Wright: An Essay in Modal Logic

With model sets in place, one of the major challenges Hintikka took was to see how the notion of satisfiability could be generalized to sets of sentences containing alethic (*it is necessary, it is possible*), deontic (*it is obligatory, it is permitted*) and epistemic (the agent knows, believes) modalities. The context of Hintikka's work was provided by C.I. Lewis' and von Wright's work on modal logic.

C.I. Lewis (1932) considered alethic principles like

(a) If necessarily A, and A entails B, then necessarily B

$\Box A \quad \Box (A \rightarrow B)$

$\Box B$

(b) Whatever is a logical law is necessary

(c) If it is necessary that A; then it is necessary that it is necessary that A

$\Box p \rightarrow \Box\Box p$

and investigated various modal systems to deal with them.

Von Wright (1951) investigates four groups of modalities:

- alethic modalities *(necessary, possible, contingent, impossible*)
- epistemic modalities (*verified or known to be true, undecided, falsified or known to be false*)
- deontic modalities (*obligatory, permitted, forbidden, indifferent*)
- existential modalities (*universal, existing, empty*)

The starting point of von Wright's investigations was the observation that the formal relations between concepts in one group are analogous to those of the concepts in the other groups. For instance, in the class of deontic modalities, if a proposition is obligatory, then its negation is forbidden. Its counterpart in alethic modalities is 'if a proposition is necessary, then its negation is impossible', which also holds. VonWright develops his former technique on constituents into a method which decides, together with the truth-tables, whether a modal sentence expresses a "truth of logic" or not. By the latter von Wright means a sentence whose truth depends "upon the specific logical nature of modal concepts" (p. 10), e.g.

$\Diamond A \wedge \Box (A \rightarrow B) \rightarrow \Diamond B$

(Von Wright, 1951, p. 10.)

Here is an illustration of von Wright's technique for the modal system he calls M_1 which studies M_1 – sentences, that is, truth-functional compounds of atomic M_1 – sentences and/or atomic N_1 – sentences, where:

Atomic M_1 – sentences, are atomic sentences prefixed with $\Diamond$ or truthfunctional compounds of atomic sentences, where the compound is prefixed with $\Diamond$

Atomic N_1 – sentences, are atomic sentences prefixed with $\Box$ or truthfunctional compounds of atomic sentences, prefixed with $\Box$.

Von Wright shows how the modal principles

(I) If $\Diamond (A \vee B) \leftrightarrow (\Diamond A \vee \Diamond B)$

(II) If A and B are logically equivalent, then $\Diamond A$ and $\Diamond B$ are logically equivalent (i.e. they have the same truth-values)

provide, in combination with the truth-table method, a decision procedure for each M_1 – sentence, that is a mechanical procedure which shows whether an M_1 – sentence is a tautology of modal logic or not. It goes like this.

- Each propositional formula A has a disjunctive normal form, that is, it can be expressed as a disjunction of conjunctions of atomic sentences or their negations.
- By principle (II), $\Diamond A$ is equivalent to $\Diamond B$ where B is the disjunction normal form of A.
- By principle (I), $\Diamond A$ is equivalent to the disjunction of, say, m conjunctions, each prefixed with $\Diamond$. The latter are (modal) constituents.

- So it seems that the truth-value of each atomic M_1 – sentence could be determined from the truth-values of its constituents by the truth-table method, provided that the constituents can appear in the truth-tables in any combination of truth-values (i.e. are independent).

To understand this later requirement, consider the modal formula $\Diamond(A \vee \neg A)$.

The disjunctive normal form of $(A \vee \neg A)$ (when the list of atomic formulas consists only of A) is $(A \vee \neg A)$. By (I) it is equivalent to $(\Diamond A \vee \Diamond\neg A)$. Its constituents are $\Diamond A$ and $\Diamond\neg$A. But given that $(A \vee \neg A)$ is a tautology, then it cannot happen, according to von Wright, that both $\Diamond A$ and $\Diamond\neg A$ are false. Thus the following principle is still needed in addition to (I) and (II):

(III) Any propositional formula A is itself possible or its negation is possible.

Now the principles (I)-(III) in combination with the truth-table method establish that $\Diamond(A \vee \neg A)$ is a logical truth in the system M_1.

By (I), $\Diamond(A \vee \neg A)$ is equivalent with $(\Diamond A \vee \Diamond\neg A)$. Its constituents are $\Diamond A$ and $\Diamond\neg A$. Thus its truth-table is:

$\Diamond A$	$\Diamond\neg A$	$(\Diamond A \vee \Diamond\neg A)$
T	*T*	*T*
T	*F*	*T*
F	*T*	*T*
F	*F*	*F*

By (III) the row in its truth table in which both A and :A are false, is deleted. Then $\Diamond(A \vee \neg A)$ comes out as "logically true in the system M_1".

What about $\Diamond(A \wedge \neg A)$? The disjunctive form of $(A \wedge \neg A)$ is empty, i.e. it is a 0-term disjunctive-sentence. We would like the truth table for $\Diamond(A \wedge \neg A)$ to be always *F* but we can't get this result from the principles listed so far and the truth-tables. Von Wright adds another principle to his list:

(IV) If a proposition is a tautology, then the proposition that it is necessary is a tautology too.

(IV) ensures that $\Box\neg(A\wedge\neg A)$ is a tautology. But $\Box\neg(A\wedge\neg A)$ is an abbreviation of $\neg\Diamond(A \wedge \neg A)$. By the truth-table method, $\Diamond(A \wedge \neg A)$ is logically false in the system M_1.

A similar method applies to atomic N_1 sentences and then to any M_1 sentence. Finally von Wright shows that these principles combined with the truthtable method shows that $\Diamond A \wedge \Box (A \rightarrow B) \rightarrow \Diamond B$ is a logical truth in the system M_1.

Von Wright (1951) (Chapter IV) also constructs a system of epistemic modalities by using epistemic counterparts of the principles (I)-(IV). They are obtained by replacing "possible" by "not falsified" and then by defining the other epistemic modalities in terms of "falsified". Thus A is falsifed, FA, expresses the same proposition as the proposition that the negation of A is verified, $V\neg A$: And A is undecided can be expressed by $\neg VA\wedge\neg V\neg A$ or equivalently by $\neg FA\wedge\neg F\neg A$. Thus from the point of view of "formal behaviour" "the verified corresponds to the necessary, the undecided to the contingent, and the falsified to the impossible."

Von Wright notices the analogy between the alethic "it is true that *p* but not neccessary that *p*" which expresses the contingency of *p* and the epistemic "it is true that *p* but not known (verified) that *p*" which expresses the epistemical contingency of *p*: But he also notices a difference between them:

Now certainly a proposition may be true without being known to be true. And certainly someone may intelligibly say "it is true that *p*, though nobody knows it". But if he said "It is true that *p*, though nobody knows it, not even I" we should feel there was something linguistically wrong. (von Wright, 1951, p. 32)

We recognize today that von Wright's example is an illustration of the so-called Moore's paradox. In his review of vonWright (1951), Strawson (1953), takes the mentioned difference between alethic and epistemic notions to throw doubts on the whole enterprise of epistemic logic: "Facts of this kind may lead us to wonder how far a system of epistemic modalities can contribute to the philosophical elucidation of words like "know" ". Later on in *Knowledge and Belief*, Hintikka (1962) offers a solution to "Moore's" paradox (cf. below.)

Von Wright also deals with combinations of epistemic and existential modalities, that is, quantified epistemic logic. Of these combinations he is particularly interested in epistemic-existential sentences (*de dicto*), e.g. "It is known that something is red", existential-epistemic sentences (*de re*), e.g. ""Something is known to be red" and the system which combines both. He points out that the first two notions require no new governing principles, but the third one requires two new principles (idem, p. 49):

(IV) If it is known that everything possesses a certain property, then everything is known to possess that property

(V) If there is a thing which is known to possess a certain property, then it is known that something possesses this property

Von Wright points out that none of these principles is convertible. Later on in Knowledge and Belief Hintikka will show that these principles are valid using the technique of model sets and model systems.

The decision method for epistemic modalities is completely similar to the previous one, i.e. we reduce the original *V E*-sentence to a truth-function of atomic constituents, the only difference being that the atomic constituents have now the form *FC* where *C* is a constituent in a monadic predicate language (see section 1), that is, a specification of a possible world built up from disjoint unary predicates of the underlying language and the existential quantifiers or their negations. Skipping over many details, the normal form of the *V E*-sentence $VEA \vee \neg FUA$ (here *EA* is an abbreviation of $\exists xA$ and *UA* of $\forall xA$(x)) turns out to be

$\neg(\neg F(\neg EA\wedge E\neg A)\vee\neg F(\neg EA\wedge\neg E\neg A))\vee(\neg F(\neg E\neg A\wedge EA)\vee\neg F(\neg E\neg A\wedge\neg EA))$

which is a truth-function of the atomic *V E*-constituents $F(\neg EA\wedge E\neg A)$, $F(\neg EA\wedge\neg E\neg A)$ and $F(\neg E\neg A\wedge EA)$. Thus we can check, by the truth-table method whether this formula is a logical truth or not. The only restriction on the distribution of truth-values (which does not apply to this case), is that if a sentence has a maximal number of *V E*-constituents (the disjunction of the correponding E-constutents is a tautology), then not all of them can be falsified.

Finally von Wright investigates "higher-order" modalities (e.g. "it is possible that it is necessary that *p*") for which he needs a new principle of reduction:

(VI) If it is possible that a certain property is possible, then the property is possible.

Von Wright shows that, if this principle is adopted, then higher-order modal sentences can be shown to be equivalent to truth-functional complexes of of first-order modal properties.

In Appendix II, von Wright investigates various axiomatic systems and compares them to C.I.Lewis's systems. Von Wright points out that if 'verified' or 'known to be true' refer to the actual knowledge of some particular person, then the counterparts of Lewis' principles may fail. We will see later on that Hintikka interpreted these notions in the same way as von Wright: they refer to idealized agents.

Modality and Quantification (Hintikka 1961)

Von Wright's analysis of modal notions did not appeal to the notion of possible worlds as alternatives to our actual world. Hintikka took a different route. He did not use constituents but model sets. In Hintikka (1957a), (1957b) and (1961) Hintikka extends the notion of satisfiability of sets of formulas of predicate logic to sets of formulas with modal operators such as "it is possible" and "it is necessary" and deontic operators like "it is obligatory that". One of his main insights is that the satisfiability of a set of sentences involving modal notions forces us to consider sets of model sets:

In our definition of satisfiability, we therefore have to consider sets of model sets. Such sets of sets we shall call *model systems*. (Hintikka, 1961, p. 122)

Hintikka inquires into the question of what conditions must model systems be subject to:

"Suppose that $\Diamond A \in \mu \in \Omega$ where Ω is a model system (and where $\Diamond$ is to be read 'possibly'). Then clearly we have to require that *A*;which is perhaps not true in the state of affairs described by μ, must nevertheless be true in some other state of affairs which could have been realized instead the one described by μ. Descriptions of such states of affairs will be called alternatives to μ. In other words, the following condition must be satisfied:

(C.M*) If $\Diamond A \in \mu \in \Omega$; then there is in Ω at least one alternative ν to μ such that $A \in \nu$" (Hintikka, 1961, p. 123)

Similar conditions are associated with $\Box$A:

(C.N) If $\Box A \in \mu \in \Omega$, and if $\nu \in \Omega$ is an alternative to μ, then $A \in \nu$.

The combination of modal notions and model sets bring in difficulties of their own. Consider a formula with an occurrence of an individual constant (or free individual symbol), which belongs to a model set μ. We can safely assume, following Hintikka, that the individual constant in question stands for an individual which exists in the state of affairs described by μ. But if the formula in question belongs to several model sets at the same time, the previous assumption has more severe consequences. It implies that an individual may exist in more than one 'possible world':

The presence of a free individual variable in the formulae of μ, we may thus say, is the formal counterpart to the existence of its value in the state of affairs described by μ. From this it follows that when a formula *A* is transferred from a model set μ to one of its alternatives say ν- we have to heed the free individual variables *A* contains. If one of them does not occur in the other formulae of ν, then the adjunction of *A* to ν is legitimate only if the relevant values of this free individual variable are assumed to exist not only in the state of affairs described by ν but also in that described by ν. In general this assumption cannot be made. Individuals which de facto exist may possibly fail to do so. (Hintikka, 1961, p. 125.)

Hintikka then considers the following variant of (C.N):

(C.N*) If $\Box A \in \mu \in \Omega$, and if $\nu \in \Omega$ is an alternative to μ, and if each free individual variable of *A* occurs in at least one other formula of ν, then $A \in \nu$.

Modal principles like (C.M*), (C.N) and (C.N*) suffice, accordingly to Hintikka, for a minimal modal logic. Once they are in place, he is able to formulate the defininition of satisfiability for sets of modal sentences:

- A set λ of formulae is satisfiable if and only if there is a model system $(\Omega; R)$ such that $\lambda \subseteq \mu$ for some member μ of Ω.

For emphasis: a model system is a pair $(\Omega; R)$ where the first member Ω is a set of model sets and the second member *R* is the relation of alternativeness which satisfies (C:M*) and (C.N*).

In Hintikka (1961) it is mentioned that the semantical system thus obtained (interesting enough, Hintikka considers the pair $(\Omega; R)$ a *semantical* system) is equivalent to vonWright's system M (vonWright, 1951.) Hintikka also mentions that by requiring the relation *R* to be transitive, we obtain a stronger system which is equivalent to Lewis' s system S4, and by requiring it to be symmetric, we obtain a semantical system whose syntactical twin is obtained by adding to the system M the Brower's axiom

$A \rightarrow \Box\Diamond A$.

Further on, he notices that by requiring *R* to be transitive and symmetric, we obtain a system which is equivalent to Lewis's S5. Hintikka (1961) adds, however: "I shall not prove these results here". Instead he mentions that the principle

$\exists x \Box F(x) \rightarrow \Box \exists x F(x)$

is not satisfiable in a model system which obeys (C.N*) (Hintikka, 1961, p. 124.)

Hintikka does not present a formal argument, but it is easy to build one.

Here it is.

Suppose there is a model set μ in a model system Ω such that:

1. $\exists x \Box F(x) \in \mu$
2. $\neg \Box \exists x F(x) \in \mu$

By a series of equivalent transformations on (2), we get

3. $\Diamond \forall x \neg F(x) \in \mu$

which, by (CM*), implies

4. $\forall x \neg F(x) \in \mu^*$

where $\mu^*$is an alternative to μ. From (1) and (C.E) we get

5. $\Box F(b) \in \mu$.

Now if we applied (C.N) to (5) we would get

6. $F(b) \in \mu^*$

which together with (4) would give $\neg P(b) \in \mu^*$, contradiction.

However, when we replace (C.N) with (C.N*), we cannot any longer make the transition from (5) to (6) given that (the individual denoted by) *b* does not occur in (other formulae of) μ^*. In other words, we can prove the validity of

$\exists x \Box P(x) \rightarrow \Box \exists x P(x)$

if we assume that if (the individual referred to by) *b* exists in μ (recall that for Hintikka a free individual variable or individual constant occurring in a formula in a model set is the formal counterpart of an individual in the possible world described by the model set), then it also exists in μ^*; but this is precisely what Hintikka denies.

Hintikka contemplates the possibility to restore the validity of $\exists x \Box F(x) \rightarrow \Box \exists x F(x)$ by requiring that "whatever exists in a possible state of affairs exists in all the alternative states of affairs; in short, that whatever exists exists necessarily." (Hintikka, 1961, p. 125). But he does not go for it (Kripke also discusses this solution in Kripke, 1963.) He also mentions a condition on model sets which "formulates exhaustively the assumption that free individual variables are transferable from a model set to its alternatives":

(C.self=*) If *b* occurs in at least one formula of μ and if ν is an alternative to μ, then $a = a \in \nu$. (Hintikka, 1961, p. 125).

Let us take stock. Hintikka (1961) considers two kinds of modal systems. One of them, which satisfies (C.self=*), embodies the assumption that all actually existing individuals exist necessarily; the other one, which satisfies (C.N*), dispenses with this assumption. We shall see that in *Knowledge and Belief* (1962), Hintikka points out an interesting difference between the alethic principle $\exists x \Box P(x) \rightarrow \Box \exists x P(x)$ that Hintikka denies, and its epistemic counterpart

$\exists x K_a F(x) \rightarrow K_a \exists x F(x)$

that Hintikka, like von Wright, endorses (cf. von Wright principle V.)

Knowledge and Belief (Hintikka 1962)

Hintikka (1962) investigates the satisfiability of sets of sentences involving knowledge and belief in the context of model sets:

...we are led to ask how the properties of model sets are affected by the presence of the notions of knowledge and belief; how, in other words, the notion of model set can be generalized in such a way that the consistency (defensibility) of a set of statements remains tantamount to its capacity of being embedded in a model set. What additional conditions are needed when the notions of knowledge and belief are present? (Hintikka, 1962, p. 34)

The basic concepts are now "the agent *a* knows that *A*", symbolized by K_aA; and "it is possible, for all the agent knows that *A*", symbolized by P_aA: In the new context Hintikka does not speak any longer of consistency and inconsistency of a formula or a set of formulae, but of *defensibility* and *indefensibility*, respectively; and instead of valid sentences he talks about *self-sustaining* sentences. Thus to show that a set of sentences is defensible one has to show that it is embeddable onto a model system $(\Omega;R)$ where Ω is a set of model sets and *R* is the alternativeness relation. And to show that a set of sentences λ is indefensible, one has to show that there is no model model set $\mu \in \Omega$ of a model system $(\Omega;R)$ such that $\lambda \subseteq \mu$.

The notions K_aA and P_aA, introduce new requirements on model systems. Some of them are simply counterparts of their alethic relatives, e.g.:

(C.K) If K_aA belongs to a model set μ (in a model system Ω), and if μ^* is an alternative to μ (with respect to the agent a) in Ω, then *A* belongs to μ^*.

(C.¬K) If $\neg K_aA$ belongs to a model set μ, then $P_a\neg A$ belongs to μ.

(C.P) If P_aA belongs to a model set μ, then there is at least one alternative μ^* to μ in Ω such that *A* belongs to μ. Etc.

But there are new requirements which reflect the specific properties of knowledge and belief. For knowledge, it is required that the alternative relation be at least reflexive and transitive:

(C.K*) If K_aA belongs to a model set μ, then A also belongs to μ

(C.KK*) If K_aA belongs to a model set μ in some model system Ω, and if μ^* is an alternative to μ (with respect to the agent *a*) in Ω, then K_aA belongs to μ^*.

The latter says that everything the agent *a* knows in the state of affairs described by μ, is also known in every *a*-alternative state of affairs described by μ^*. It correspond to the knowledge-axiom:

$K_aA \rightarrow K_aK_aA$.

The purpose of (C.KK*) is to enforce a robust, infaillible notion of knowledge. It can be shown that in the absence of (C.KK*), there is a model set μ in a model system Ω such both $K_aA \in \mu$ and $K_a(B\rightarrow\neg K_aA) \in \mu$. That is, in such situations, the agent knows that *A* but he also knows that if *B* is the case, he will loose the knowledge that *A*. Hintikka rejected this "faillibilist" conception of knowledge. (C.KK*) rules out model sets of this kind.

Hintikka's defense of the (C.KK*) principle makes it clear that Hintikka is concerned with *virtual knowledge*, that is, knowledge of cognitively perfect agents who are sufficiently clever to be able to carry out the implications of what they know. In accordance with this line, Hintikka's interpretation of all the principles (C.K)-(C.KK*) is that for a cognitively ideal agent it is irrational (indefensible) to claim that e.g. he knows that *A* and to deny, on the same occasion, that *A*.

Knowledge and Belief contains many indefensibility arguments. The proof of the indefensibility of a statement *A* is interpreted, in the spirit of the model set technique, as an aborted attempt to describe a state of affairs in which *A* would be true; and in the same spirit "every proof of the fact that a statement *p* implies epistemically another statement q is, intuitively speaking, an aborted attempt to describe consistently a state of affairs (with alternatives) in which *p* would be true but *q* false." (Hintikka, 1962, p. 45).

Here is one of Hintikka's examples of a self-sustaining principle. We show that

$K_aA \wedge K_aB \rightarrow K_a(A \wedge B)$

is self-sustaining by trying to build up a model set in which the antecedent is true (i.e. it belongs to a model set) and the consequent is false (i.e. its negation belongs to the same model set).

Suppose there is a model set μ in a model system Ω such that

1. $K_aA \wedge K_aB \in \mu$ (assumption)
2. $\neg K_a(A \wedge B) \in \mu$ (assumption)

From (2) and (C.¬K) we get

3. $P_a\neg(A \wedge B) \in \mu$

and thus by

4. $\neg(A \wedge B) \in \mu^*$

for some alternative μ^* to μ.

Skipping over a couple of steps, which lead to $K_aA \in \mu$ and $K_aB \in \mu$, we infer by (C.K):

5. $A \in \mu^*$
6. $B \in \mu^*$
7. $(A \wedge B) \in \mu^*$ (5,6 and logic).

We have derived a contradiction, which shows that the negation of $K_aA \wedge K_aB \rightarrow K_a(A\wedge B)$ is indefensible and thus this sentence itself is self-sustaining.

Using this technique, Hintikka is able to show how the epistemic counterparts of C.I Lewis S4 are self-sustaining. He also gives a solution to some traditional puzzles, like Moore's paradox. Finally, Hintikka defends his program in epistemic logic against Quine's criticisms of modal logic by showing that substitutivity of identity and existential generalization make sense in modal contexts, provided certain assumptions are fulfilled. Let me shortly say few words about some of these matters.

Moore's paradox

In Hintikka (1962) he discusses Moore's paradox of "saying and disbelieving". He starts by noticing that there is something logically queer about someone asserting

1. *A* but I do not believe that *A*

even if it is not self-contradictory (indefensible) according to the criteria he set up. He offers the following explanation of the absurdity of (1).

It is expected from anyone (say b) who asserts the sentence

2. *A* but a does not believe that *A*

"that it is possible for him to believe what he says, that is, it would be defensible for him to say

3. I believe that the case is at follows: *A* but a does not believe that *A*". (idem p. 52)

This sentence is of the form

4. $B_b(A \wedge \neg B_aA)$

while (1) is of the form

5. $B_a(A \wedge \neg B_aA)$.

Now Hintikka shows that (5), unlike (4), is indefensible in his system. To show this, he follows the usual reductio ad absurdum proof, and supposes (5) belongs to a model set. Then using the transitivity of belief, he derives a contradiction (p. 52). Hintikka mentions that he has offered a solution to Moore's puzzle which does not invoke any additional principles to the ones he has so far introduced. Perhaps a short critical remark should be considered at this point. True, Hintikka does not strengthen the *logical*

principles that govern knowledge and belief. He does introduce, however, without noticing, an extraassumption, which is a norm of assertion: assert a sentence only if you believe it (i.e it is defensible).

Quantifiers and identity in epistemic logic: 'knowing who'

The combination of epistemic notions with quantifiers and identity leads to problems analogoue to those we encountered in alethic quantified systems. These matters have been extensively debated and we will not explore them in great details here. We shall focus on Hintikka's notion of 'knowing who' and the way he perceived the difference between the logical treatment of alethic and epistemic notions.

The presence of quantifiers, identity and knowledge operators allows Hintikka to represent in his logical setting the notion "*a knows who b* is". For instance, he renders "*a* knows who Mr. Hyde is" as

$\exists x K_a(x=h)$

This notion introduces requirements of its own on model systems:

(C.EK=EK=*) If $\exists x K_a(b=x) \in \mu$, and μ^* is an epistemic alternative to μ with respect to a; then $\exists x K_a(b=x) \in \mu^*$.

(C.EK=) If $\exists x K_a(b=x) \in \mu$, then $\exists x(b=x) \in \mu$

The second condition tells us that if *a* knows who (the individual referred to by) *b* is in the possible world μ, then *b* exists in μ. The first condition tells us that if *a* knows who *b* is in the possible world μ, then *a* knows who *b* is in all *a*'s epistemic alternatives.

Hintikka's justification of these principles is based on his decision to take 'knowing who' to behave logically in the same way as 'knowing that' (Hintikka, 1962, p. 116). Thus (C.EK=) may be seen as the counterpart of the principle

$K_aA \rightarrow A$

for *knowing who*. And analogously, (C.EK=EK=*) may be seen as the counterpart for knowing who of (C.K.K*), which ensures the validity of the axiom

$K_aA \rightarrow K_aK_aA$:

We pointed out earlier that this axiom (and its semantical counterpart (C.K.K*)) ensure a robust notion of knowledge. In the same way, (C.EK=EK=*) ensures that if an agent knows who (the individual denoted by) *b* is, then he is not going to loose this knowledge in any of his epistemic alternatives.

More generally, existential and universal quantifiers, have, in non-epistemic contexts, rules of instantiation which are completely analogous to the rules (C.∃) and (C.U). But the interaction of quantifiers and epistemic operators produces additional problems, as already witnessed by (C.EK=EK=*) and (C.EK=). Hintikka compares these problems with their counterparts in alethic contexts referring back to Hintikka (1961). When we discussed that paper in an earlier section, we pointed out that constructions of the form

$(\exists x\Box\ldots x\ldots) \in \mu\ (\exists x\Diamond\ldots x\ldots) \in \mu$

raise the question of whether an individual *existing* in a model set μ also exists in the alternatives that □ or ◊ forces us to consider.

In *Knowledge and Belief*, Hintikka considers the analogue constructions

$(\exists x K_a\ldots x\ldots) \in \mu\ (\exists x P_a\ldots x\ldots) \in \mu$

but he interprets them in a different way. The quantifiers in these constructions "range", not over only individuals existing in μ but over individuals existing in μ which are also know (in the sense of knowing who, that is, identified). Thereby the problem these constructions raise is whether an individual known by *a* in the model set μ, is also known by a in *a*-alternatives to μ. And given Hintikka's notion of *knowing who* and the analogy he draws between this notion and *knowing that*, his answer is positive. That is, in the general case, the following constraints on modal systems are added:

(C.E_{ep}) If $\exists xA \in \mu$, then $A(x/b) \in \mu$ and $\exists x K_a(x = b) \in \mu$ (it is supposed that *A* contains an occurrence of the operator K_a or P_a and '*x*' occurs within the scope of one of them in *A* but not within the scope of any other epistemic operator).

(C.U_{ep}) If $\forall xA \in \mu$ and $\exists x K_a(x = b) \in \mu$, then $A(x/b) \in \mu$ (with the same assumptions as in (C.E_{ep})).

We note that both $(\exists x K_{a\ldots}x\ldots) \in \mu$ and $(\exists x P_a\ldots x\ldots) \in \mu$ fall under the incidence of (C.E_{ep}). They both generate a substitutional instance $(K_a\ldots b\ldots) \in \mu$ and $(K_a\ldots b\ldots,) \in \mu$, respectively, such that *a* knows who *b* is in μ. (C.EK=EK=*) further ensures that *a* knows who *b* is also in *a*'s epistemic alternatives.

With the help of these principles, Hintikka is able to show the self-sustenability of the principle

$\exists x K_a F(x) \rightarrow K_a \exists x F(x)$

whose counterpart in alethic logic

$\exists x \Box F(x) \rightarrow \Box \exists x F(x)$

he rejects. Here is Hintikka's argument (1962, p. 117).

Suppose there is a model set μ in a model system such that

1. $\exists x K_a F(x) \in \mu$, and
2. $\neg K_a \exists x F(x) \in \mu$.

By equivalent transformations on (2) we get:

3. $P_a \forall x \neg F(x)$

which togetner with (C.P) implies

4. $\forall x \neg F(x) \in \mu^*$

where μ^* is an *a*-alternative to μ.

From (1) and (C.E_{ep}) we get

5. $K_a F(x/b) \in \mu$
6. $\exists x K_a(x = b) \in \mu$.

From (6) we obtain using by (C.EK=EK=*)

7. $\exists x K_a(b = x) \in \mu^*$

from which we derive, using (C.EK=)

8. $\exists x(b = x) \in \mu^*$.

From (5) and (C.K) we get:

9. $F(x/b) \in \mu^*$

and from (6), by (C.EK=EK=*) we obtain

10. $\exists x K_a(b = x) \in \mu^*$

Now that *a* knows in μ^* who (the referent of) *b* is, we can instantiate the formula in (4) and get

10. $\neg F(x/b) \in \mu^*$.

We have obtained the desired contradiction which shows the indefensibility of the negation of $\exists x K_a F(x) \rightarrow K_a \exists x F(x)$ and thereby the self-sustainability of the formula itself.

Hintikka concludes the argument with the following observation:

The self-sustenance of $[\exists x K_a F(x) \rightarrow K_a \exists x F(x)]$ shows that there is an interesting difference between the logical behavior of the notion of knowledge and that of the notion of necessity toward quantifiers, in spite of the fact that the two are closely similar in many respects. For the notion of necessity the analogue of $[\exists x K_a F(x) \rightarrow K_a \exists x F(x)]$ is not valid. From the fact alone that there exists an individual which cannot help having a certain property it does not follow that there necessarily is an individual with this property. For the individual first mentioned might conceivably not exist. (Hintikka, 1962, p. 117)

In a footnote Hintikka refers to the argument against the self-sustenance of

$\exists x \Box P(x) \rightarrow \Box \exists x P(x)$

that he presented in his earlier paper (Hintikka, 1961). Indeed, as we recall from our earlier section, the proof of the validity of this sentence required the assumption that if

(the individual referred to by) *b* exists in *μ*, then it also exists in *μ**. Hintikka rejected it, and consistently with that, he also rejects it in *Knowledge and Belief*, as the quote above indicates.

Hintikka on Quine's criticism of modal logic

Hintikka's work in epistemic logic went against Quine's arguments to the effect that quantifier rules like existential generalization and substitutivity of identity are misguided in alethic contexts. Hintikka acknowledges that none of these rules holds uniformly in epistemic contexts. That is, one cannot always infer

1. *a* knows that Dr. Jekyll is a murderer (i.e., $K_a(M(j))$) from the premises

2. *a* knows that Mr. Hyde is a murderer (i.e., $K_a(M(h))$) and

3. Dr. Jekyll is the same man as Mr. Hyde (i.e. $j = h$).

Neither can one infer

4. $(\exists x)K_a(M(x))$

from (2).

For Quine, the failure of substitutivity in the first example indicates the referential opacity of the position occupied by the term "Mr. Hyde". This feature is also responsible for the impossibility of existential generalization in the second example. Quine's solution was to restrict these rules to referentially transparent contexts.

For Hintikka (1962), the *failures are not failures* of referentiality, that is, they are not due, as Quine sometimes seems to suggest, to the way in which our singular terms refer to objects. The source of the failures has to do rather with *multiple referentiality*, that is, with the fact that a has to consider several epistemic alternatives to the current one. In some of these "possible worlds" the proper names "Dr. Jekyll" and "Mr. Hyde" refer to two distinct men (p. 102). For Hintikka substitutivity of identity makes perfectly good sense in epistemic contexts, provided that a knows that Mr. Hyde is the same man as Dr. Jenkyll, a requirement that Hintikka formulates as

$K_a(h = j)$

In an analogous way, Hintikka goes on, "quantifying in" that is, moving from

$K_a \ldots h \ldots$

to

$\exists x K_a \ldots x \ldots$

goes smoothly whenever *a knows who* Mr. Hyde is, that is, whenever $\exists x K_a(x = h)$ also holds (p. 112).

Semantically speaking, Hintikka (1962) interprets clauses of the form $K_a(h = j)$ as saying that the two names refer to the same individual in every *a*-epistemic alternative; and he interprets clauses of the form $\exists x K_a(x = h)$ as ensuring that *h* names the same individual in every relevant epistemic alternative (pp. 111-112). Yet, I would like to claim, against Hintikka, that none of the rules Hintikka proposes ensures that '*b*' refers to one and the same individual in every possible world in which *b* exists. This can be seen in the following way.

Suppose that $\exists x K_a(b = x) \in \mu$, and μ^* is an epistemic alternative to *μ*. From this one can derive, using (C.EK=EK=*) and (C.EK=), that

$\exists x(b = x) \in \mu$

and

$\exists x(b = x) \in \mu^*$:

The most we can now get from these conditions, using the model sets technique based on the substitutional interpretation of quantifiers, is that $b = c \in \mu$ and $b = d \in \mu^*$ for some constants *c* and *d*. The two conditions are compatible with both the "descriptive" interpretation of individual constants according to which the referent of such a constant may vary from world to world, and with the "rigid" interpretation according to which the interpretation remains fixed. In other words, the non-referential semantics with its substitutional interpretation of quantifiers the technique of model sets relies on, cannot enforce that '*b*' refers to one and the same individual in every relevant possible world. In our particular example, '*b*' and '*c*' could very well refer to one and the same individual, say *e*, in the possible world described by *μ*, and, on the other side, '*b*' and '*d*' could refer to the individual $d \neq e$ in the world described by *μ**. Hintikka came to realize this later on, or so we would like to think. For instance, in Hintikka and Sandu (1995) the authors claim that when the quantifiers are interpreted objectually (and extensionally), then $\exists x K_a(b = x)$ and $\exists x \Box(b = x)$ express that '*b*' is a "rigid designation" in epistemic and alethic contexts, respectively (p. 181 in Hintikka 1998).

Hintikka, Kanger and Kripke

Kanger's reconstruction of Hintikka's early work (Kanger, 1972)

As mentioned earlier, Hintikka's model sets share common features with Carnapian state descriptions. Carnap (1946, 1947) defines a notion of universal modality "it is necessary that *A*", □*A*, in a straightforward way:

□A is true at a state description Σ if and only if *A* is true at all state descriptions Σ´.

An essential new ingredient in Hintikka's work, compared to Carnap, is the alternativeness relation *R* and the notion of model system (*Ω, R*). By varying *R* Hintikka is able to model various modal and epistemic notions, as we have seen in earlier sections. Model systems appear in print in Hintikka's early work in 1957, 1961, and 1962. But a striking difference between Hintikka and Carnap, as well as, as we shall see, between Hitnikka and Kripke, and Hintikka and Kanger, is that Hintikka never presented explicitly in his early work a recursive definition of the notion of truth in a model (model set, possible world) for a logical language which combines both quantifiers and modalities. That is, he never presented a definition of the form

A is true in a model (possible world, model set) iff....

where A runs over modal and quantified formulas. Hintikka was concerned with the semantical notion of consistency (satisfiability, defensibility) of a sentence or set of sentences, and not with the notion of truth in a particular model, as he often emphasized (e.g. Hintikka, 1961). This had some important consequences.

In model sets (and state descriptions) quantifiers are treated substitutionally. The substitutive interpretation of quantifiers dispenses with the notion of model and with the notion of reference. For this reason, although Hintikka often speaks of free variables and individual constants referring to an individual or another in the possible world describe by the relevant model set, this talk remains at an informal level and the assumptions behind it are never made explicit.

It is interesting, against this background, to compare Hintikka's ideas to the work of two of his contemporaries, Stig Kanger and Saul Kripke, who worked on the same problems during the same time as Hintikka. Kanger is the only one of the three who presented a detailed comparison of his own framework with Kanger's and Hintikka's systems. In his comparison, Kanger (1972) extracts from Hintikka's theory a recursive truth-definition of the notion "A is true in a state-description *S* of a model system (Φ, *R*)" but confesses that

"We shall here formulate Hintikka's theory so that its relationship with Carnap becomes explicit- or maybe over-explicit. (In fact, we are depriving Hintikka's theory of one of its virtues.)" (Kanger, 1972, p. 115).

This is an over-explicitation indeed, as I tried to point out that due to his special interests, Hintikka took as the basic concept of his semantical theory the notion of satisfiability.

In Kanger's reconstruction, he attributes to Hintikka the notion truth in an interpretation(Ω, H) that he denotes by $T(A, (\Omega, H))$. Here Ω is a nonempty class of state descrptions (!) and H is a a member of Ω. It is useful to recall the definition of a state-description:

(C.1) If A is an atomic sentence (or an identity) then not both $A \in \mu$ and $\neg A \in \mu$

(C.2) If A is an atomic sentence (or an identity) then either $A \in \mu$ or $\neg A \in \mu$

(C.3) If A is an atomic sentence (or an identity) or the negation of an atomic sentence (identity), and if $A \in \mu$ and $a = b \in \mu$ and if B is exactly like A except that a and b have been interchanged in one or several places, then $B \in \mu$.

(C.4) Not $\neg(b = b) \in \mu$.

Kanger defines $T(A, (\Omega, H))$ recursively for *sentences*:

(a) $T(P(a_1,\ldots, a_n); (\Omega, H))$ is the truth-value T (true) iff $P(a_1,\ldots, a_n) \in H$;

(b) $T(a_1 = a_2; (\Omega, H))$ is T iff $a_1 = a_2 \in H$

(c) $T(\neg A, (\Omega, H))$ is T iff $A \notin H$

The clauses for other extensional connectives are standard.

(d) $T(\forall xB, (\Omega, H))$ is the truth-value T iff $T(B(x/b); (\Omega,$ H)) is T for each individual constant b; etc

The truth for modal sentences uses the relation of accessibility:

- $T(\Box A; (\Omega, H))$ is T iff $T(\Box A, (\Omega, H))$ is T for every $H' \in \Phi$ such that HRH'.

Kanger's "over-explicitation" or rather "reconversion" of Hintikka's model systems into state-sescriptions and his attribution to Hintikka of the notion of "truth in a state-description" are useful. It illustrates the strategy of how one can take satisfiability as the basic semantical notion and then extract a recursive definition of the derived notion of "truth in a possible world". It leaves out, however, the restrictions on model systems that played such a major role in Hintikka's thought.

Kripke and Hintikka

In contrast to Hintikka, both Kanger (1957, 1972) and Kripke (1959, 1963) take "truth in a possible world (model)" as the basic semantical notion, and define satisfiability in terms of it. Also both of them use, not substitutional quantification, as Hintikka and Carnap did, but the Tarskian notion of satisfaction. In other words, quantifiers are defined objectually, the range of quantifiers is made explicit and so is the notion of reference and model.

Kripke (1959) considers a modal language which contains individual and propositional variables, predicate symbols and the modal operator $\Box$.

Given a non-empty domain D of individuals, for each formula (!) A in the object language one defines the notion of a complete assignment for A in D, which is a function that assigns:

- to every free individual variable of A an individual in D,
- to every propositional variable which is a subformula of A either the truthvalue T or F, and
- to every n-place predicate symbol P occurring in A an n-place relation on D.

A *model of* A and D is an ordered pair (G, K) of complete assignments for A in D, where $G \in K$ and all the assignments of K agree on the free variables of A. The assignment G is supposed to play the role of the actual world and the set K is to be thought of as the set of all possible worlds. Notice that there is no accessibility relation on K.

Given a model (G, K) for A and D, every subformula B of A receives the value T or F relatively to an arbitrary assignment $H \in K$ in a recursive way:

(i) If B is an atomic formula $P(x_1,\ldots, x_n)$, then it receives the value T if and only if the n-tuple $(a_1,\ldots, a_n)$ assigned by H to the free variables $x_1,\ldots, x_n$ belongs to the extension of P as given by H; otherwise it is assigned the value F.

(ii) If B is $x_1 = x_2$, then it receives the value T if and only if the individual in D assigned to x_1 by H is the same as that assigned to x_2. Otherwise it receives the value F. The clauses for the extensional connectives are standard.

(iii) B is $\forall xC(x)$, then it receives the value T if and only if $B(x)$ is assigned the value T for every assignment of an element of D to x; otherwise it receives the value F.

(iv) If B is $\Box C$, then it receives the value T if and only if every member of K assigns the value T to C; otherwise it receives the value F.

Few things need to be emphasized in Kripke's definition:

- Possible worlds are truth-value assignments
- They all share a common domain of individuals D
- A model is relativized to a modal formula A
- A free variable x is assigned an element of the commonly shared domain D (and thus its interpretation remains "rigid")
- On the other side, the interpretation of a predicate symbol P may vary from world to world, that is, there are assignments in K which assigns to P different extensions in the domain D
- Given that there is no accessibility relation, $\Box$ expresses an universal (S5) notion of necessity, like in Carnap.

A formula A is said to be *valid in a model* (G, K) of A and D if A is assigned the value T by G (informally: A is true in the actual world). Actually later on in Kripke (1963) he acknowledges that a better notion than “valid in a model” is “true in a model”. A *is valid in D* simpliciter if A is valid in every model of A on D. A is *satisfiable* if there is a non-empty domain D and a model of A on D such that A is valid in this model. Finally, A is *universally valid* if A is satisfiable in every non-empty domain D. The formula B is *semantically entailed* by $A_1, A_2, \ldots, A_n$ if and only if $(A_1 \wedge A_2 \wedge \ldots \wedge A_n) \rightarrow B$ is universally valid. Notice that if $n = 0$ this amounts to B being universally valid.

Kripke proves a completeness theorem which shows that B is semantically entailed by $A_1, A_2, \ldots, A_n$ if and only if the semantical tableau construction where $A_1, A_2, \ldots, A_n$ are on the left side and B is on the right side of the tableau closes. We will not enter into these details here but we take note of the con-nection between semantic tableaux (model sets) and the semantical notion of entailment and universal validity which are defined in terms of truth in a model.

In Kripke (1963), this picture is radically changed. In a footnote at the beginning of the paper, Kripke tells the readers that: The authors closest to the present theory appear to be Hintikka and Kanger. The present treatment of quantification, however, is unique as far as I know, althought it derives some inspiration from acquaintance with the very different methods of Prior and Hintikka. (Kripke 1963, Footnote 1, page 83.)

What is this "unique treatment of quantification"? Essentially, it is obtained by imposing a quantificational structure on a set of possible worlds (and an accessibility relation). This happens by

- relativizing the range of a quantifier to a possible world; in order to do this, each possible world is endowed with its own universe.
- providing a semantic value for free variables à la Tarski through the notion of assignment; the objects assigned to

the free variables may come from any of the individual universes.

• relativizing the notion of satisfaction to a possible world and an assignment.

Here are the technical details.

The starting point is the notion of model structure (m.s.) for a propositional modal language. It is a triple (*G, K, R*), where *K* is the set of possible worlds, *G* is the actual world, $G \in K$, and *R* is an accessibility relation on *K* that Kripke interprets as follows:

• For every H_1, $H_2 \in K$, H_1RH_2 means that H_2 is possible relative to H_1, that is, every proposition true in H_2 is possible in H_1. (Kripke, 1963, p. 84.)

Kripke notices that reflexivity of *R* is a natural requirement and mentions that one may impose additional requirements, corresponding to various axioms of modal logic.

Given a model structure (*G;K;R*), a model for the propositional modal language is a binary function *φ* which assigns to each atomic formula *P* and possible world *H* in *K*, a truth-value *φ*(*P, H*) which is *T* of *F*. We recognize in the notion of a model the ancestor of what nowadays is called a *Kripke-model* for a modal propositional language.

Given a model, one can then assign by induction truth-values for complex propositional formulas. The clause which interests us is:

• $\varphi(\Box A,H) = T$ iff $\varphi(A, H') = T$ for every $H' \in K$ such that HRH'. Informally: *A* is necessary in *H* iff *A* is true in all worlds *H´* possible relative to *H*.

A *quantified model structure* (q.m.s.) is a model structure (*G,K,R*) together with a function *ψ* which assigns to every possible world *H* in *K* its own domain *ψ*(*H*), that is, the set of individuals existing in *H.* We are told that:

Notice, of course, that *ψ*(*H*) need not be the same set for different arguments *H*, just as, intuitively, in worlds other than the real one, some actually exising individuals may be absent while new individuals, like Pegasus, may appear. (Kripke, 1963).

Let *U* be the set of all individuals which exist in some world or another in *K* (i.e. $U = \bigcup_{H \in K} \psi(H)$.) A *quantificational model* on a q.m. is now defined as a binary function $\varphi(P^n, H)$ where the second variables ranges over possible worlds in *K* and the first variable over predicate symbols of the underlying language. When $n = 0$, P^n is a propositional letter and thus $\varphi(P^n, H)$ is *T* or *F*. For $n \geq 1$, $\varphi(P^n, H)$ is a subset of U^n, that is, an n-place relation which is the extension of P^n in the possible world *H*.

Kripke defines inductively *φ*(*A, H*), the truth value of the formula *A* in the possible world *H relative to an assignment* of individuals in *U* to the free variables of *A*:

(i) The case of propositional variables has been taken care of.

(ii) If *A* is $P^n(x_{1,\ldots,}\ x_n)$ ($n \geq 1$), and the assignment assigns the individuals $a_1,\ldots,\ a_n$ from *U* to the variables $x_{1,\ldots,}\ x_n$, then $\varphi(P^n, H) = T$ if the n-tuple $(a_1,\ldots,\ a_n)$ belongs to $\varphi(P^n, H)$.

The inductive steps for the propositional connectives are straightforward.

(iii) If *A* is $\Box B$, $\varphi(A, H) = T$ relatively to the assignment is *T* if and only if $\varphi(B, H') = T$ for all the possible worlds *H´* such that HRH' (relative to the same assignment).

(iv) Assume now we have a formula $A(x, y_1,\ldots, y_n)$ where $x, y_1,\ldots, y_n$ are the only free variables present. Assume also that $\varphi(A(x, y_1,\ldots, y_n), H)$ has been defined for each possible assignment to the free variables $x, y_1,\ldots, y_n$. Then we define $\varphi(\forall xA(x, y_1,\ldots, y_n);H) = T$ relative to an assignment $a_1,\ldots, a_n$ of elements of *U* to the free variables $y_1,\ldots, y_n$ if $\varphi(A(x, y_1,\ldots, y_n), H) = T$ for every assignment of *b*, $a_1,\ldots, a_n$ to the free variables $x, y_1,\ldots, y_n$, where *b* is also an element of *ψ*(*H*). As already mentioned, the last restriction means that we quantify only over the individuals existing in *H*.

Kripke illustrates the above definitions by giving counter-examples to two familiar formulas:

$\forall x\Box F(x) \rightarrow \Box\forall xF(x)$; $\Box\forall xF(x) \rightarrow \forall x\Box F(x)$

The formula on the left is known as the *Barcan formula*, and that on the right as the *converse of the Barcan formula*. I will consider here only Kripke's counterexample to the converse of the Barcan formula. It is a model structure (*G, K, R*) where *K* consists of two worlds, the actual world *G* and a second world *H*. The accessibility relation *R* is the universal relation

$R = \{(G, H), (H, G); (G, G); (H, H)\}$.

The quantificational model structure on (*G, K, R*) is formed by endowing each possible world with its own domain. In the present case we take: $\varphi(G) = \{a, b\}$ and $\psi(H) = \{a\}$. Finally, to obtain a model, we have to define an extension of the predicate symbol *P* in each possible world. Following Kripke we let: $\varphi(P, G) = \{a, b\}$ and $\varphi(P, H) = \{a\}$.

The first observation is that $\forall xF(x)$ is true in both worlds, (relative to the empty assignment), that is, $\varphi(\forall xF(x), G) = T$ and $\varphi(\forall xF(x), H) = T$, given that any assignment of an element of $\psi(G)$ to *x* is a member of $\varphi(F, G)$ and similarly for $\varphi(\forall xF(x), H) = T$. Thus $\Box\forall xF(x)$ is true in *G*. On the other side, $\forall x\Box F(x)$ is true in *G* iff $\Box\psi(G)$ is true in *G* for every individual in *G* assigned to *x* iff $\Box\psi(G)$ is true in *G* when *a* is assigned to *x* and when *b* is assigned to *x*. The first claim holds iff *a* belongs to the extension of *F* in both *G* and in *H*. This is true. The second claims holds iff *b* belongs to the extension of *F* in both *G* and in *H*. This is false, given that *b* does not belong to the extension of *F* in *H*.

It is interesting to compare Kripke's treatment of the converse of the Barcan formulas to Hintikka's treatment of the counterpart of this formula in epistemic logic.

Hintikka (1962) shows that

$\forall xF(x) \rightarrow \forall xKF(x)$

is self-sustainable by showing that its negation is indefensible. We follow Hintikka's argument (and his numbering) which is essentially the same as the earlier argument which established the self-sustainability of

$\exists xK_aF(x) \rightarrow K_a\exists xF(x)$.

Suppose there is a model set *μ* in a model system such that

(134) $K_a\forall xF(x) \in \mu$ and

(135) $\neg\forall xKF(x) \in \mu$.

By a series of equivalent transformations, (135) is reduced to

(136) $\exists xP_a\neg F(x) \in \mu$

which, by the rules (C.Ep), implies

(137) $P_a\neg F(x/b) \in \mu$, for an individual constant *b*, and

(138) $\exists xK_a(x = b) \in \mu$.

From (137) we get

(139) $\neg F(x/b) \in \mu^*$

where μ^* is an epistemic alternative to *μ*, and from (138) we also get using (C.EK=EK=*)

(140) $\exists xK_a(x = b) \in \mu^*$

We apply (C.EK=) to (140) to obtain:

(141) $\exists x(x = b) \in \mu^*$.

From (134) we get

(142) $\forall xF(x) \in \mu^*$

and given (141), we can apply (C.Uep) and derive

(143) $F(x/b) \in \mu^*$.

We ended in a contradiction and conclude that the negation of the converse ofvthe Barcan formula is indefensible.

We notice that the contradiction is obtained by first deriving a substitutional instance $P_a\neg F(x/b) \in \mu$ of (136) from which we get that (the individual denoted by) *b*, introduced in *μ*, is not F in μ^*. On the other side, from (134)

we know that all individuals in μ^* are F in μ^*. But b exists in μ^*, by (141), and therefore by instantiating with b in μ^* we get that b is F in μ^*.

In Kripke's setting one cannot get a contradiction by assuming that $\Box\forall x F(x)$ and the negation of $\forall x \Box F(x)$ (i.e., $\exists x \neg F(x)$) are true in G. A contradiction is avoided because (the individual denoted by) b *in* G (think of G as μ and of H as μ^*) does not have the property F in H, given that it does not exist in H (an individual which does not exist in a world cannot have a property at that world, because the extension of a predicate is formed only from the individuals existing at that world!) But in Hintikka's model systems, the rules (C.Ep), (C.EK=EK=*), and (C.EK=) have the consequence that (the individual denoted by) b in μ exists in μ^* and thereby falls under the incidence of the universal quantifier in μ *.

We witness here, one more time, the difference that exists between Hintikka's treatment of epistemic notions (in the context of model sets), and Kripke's treatment of alethic notions (in a model-theoretical setting). The source of the difference does not lie, we would say, in the substitutional versus the Tarskian interpretation of quantifiers, but in the principle (C.EK=EK=*):

(C.EK=EK=*) If $\exists x K_a(b = x) \in \mu$, and μ^* is an epistemic alternative to μ with respect to a; then $\exists x K_a(b = x) \in \mu^*$

that, recalling our earlier discussion, Hintikka associates with his notion of 'knowing who'.

On a more critical note, let us note that Hintikka's argument depends on whether we accept his representation of "a knowing who b is" as $\exists x K_a(b = x)$.

It is not obvious to us that the latter is the correct representation of the former, as also Lemmon remaked in his review of *Knowledge and Belief*. We think that Hintikka was driven to this interpretation and to (C.EK=EK=*) by his substitutional interpretation of quantifiers, but we will not discuss this matter here. Instead we will stay content with the following remarks.

In his review of Hintikka (1962), Chisholm (1963) points out that Hintikka's idea of multiple reference pushes him towards metaphysics (essentialism), for it presupposes a method of *cross-identification* on the basis of which one would have to be able to establish when an individual in one world is the same as an individual in another world. Chisholm reviewed several criteria of crossidentifications, including essential properties, but did not find any of them fully acceptable. Chisholm (1967) ended up on a rather sceptical note: if we had a satisfactory answer to the question of *knowing who*, we would also have criteria to distinguish essential from non-essential properties.

Chisholm's criticisms (and similar criticisms coming from Castaneda motivated Hintikka to develop methods of cross-identification in the years to come. In Hintikka (1969) he introduces the distinction between *public* and *perspectival* identification. I may have heard of Barack Obama, know who he is (the President of US) but have never seen him. When I finally see him, I identify him perspectivally, that is, I place him on my visual map. Or, I may be in a situation in which I have seen him, but fail to associate him with Barack Obama, i.e. fail to identify him publicly. When this happens I know who Barack Obama is. Hintikka developed the distinction between "two modes of identification" in Hintikka (1969). Corresponding to two modes of identification, the representation in the logical language of "knowing who b is" bifurcates now into $\exists x K_a(b = x)$ (public) and $Ex K_a(b = x)$ (perspectival).

Kripke and Hintikka on existence

Kripke (1963) considers the possibility of blocking the counterexamples to the Barcan formulas in alethic contexts by restricting the domains of the model structure. According to Kripke's proposal the counter-example to the converse of the Barcan formula could be blocked by requiring that whenever HRH', we must also have $\psi(H) \subseteq (H')$. This type of solution leads (when the inclusion is also formulated for the other direction) to accepting that all actually existing individuals exist necessarily, a principle that Hintikka rejects. Hintikka, as we pointed out earlier, preferred to go for an alethic system with existential presuppositions, enforced through the principle (C.N*). Accepting this principle, however, leads to some restriction on the rule of substitution.

Perhaps with an eye on Hintikka's suggestion, Kripke (1963) considers also the possibility to introduce existence. He introduces existence as a predicate in a modal system (quantified M) based on a quantification theory in which, following a proposal by Quine, only closed formulae are asserted. (Kripke 1963, p. 89). We will not present here the axioms of quantified M. But it is worth mentioning that the existence predicate avoids the principle that everything exists necessarily that bothered Hintikka. Let us follow Kripke and see how.

The existence predicate $E(x)$ has to satisfy, for each model φ on a m.s. (G, K, R) the condition $\varphi(E, H) = (H)$, for each possible world H. In other words, everything in the domain of H exists. As Kripke remarks, this condition can be also given an axiomatic form, as the closures of formulae of the form: $\forall x A(x) \wedge E(y) \rightarrow A(y)$ and $\forall x E(x)$. But then "necessarily everything exists, $\Box\forall x E(x)$ becomes a theorem of the system. Yet, as Kripke shows, existence differs from the tautological predicate $A(x) \vee \neg$A(x). This predicate is had by every individual necessarily, i.e. $\forall x \Box(A(x) \vee \neg A(x))$ is a theorem of the system, $\forall x \Box E(x)$ is not. (Kripke, 1963, p. 90.)

Kanger (1957)

In Kanger (1957) "a modification and extension of Tarski's theory was made with the purpose of obtaining semantics for modal formulas." (Kanger, 1972, p. 114)

That is, like Kripke, Kanger has a full blown model-theoretical treatment of modal notions, with "truth in a possible world (system)" as the basic semantical notion. He assigns extensions to predicate symbols relatively to a domain. These extensions may vary when we move from one domain to another. The various domains are to be thought of as possible worlds related by an accessibility relation. The main difference with Kripke (1959) and (1963), we would say, is the fact that the interpretation of a variable (in the standard sense) varies from a domain to another. In other words, variables are treated intensionally.

Less informally, a system is a triple (U, W, V) where:

- U is a universe (domain)
- W is a binary function which assigns extensions to predicate symbols in every universe, i.e., $W(P^n, U) \subseteq U^n$for every n-place predicate symbol and universe U.
- V is a binary function which assigns a value to every individual variable and universe U, that is, $V(x, U) \in U$ for every individual variable x and universe U.

Here are Kanger's clauses for the recursive truth-definition of the notion "A is true (false) in the system (U, W, V)", in symbols $T(A, (U, W, V)) = T$. The clauses for the non-modal formulas go like this:

(i) $T(x = y, (U, W, V)) = T$ iff $V(x, U) = V(y, U)$; otherwise it is F.

(ii) $T(R(x, y), (U, W, V)) = T$ iff $((V(x, y), V(y, U)) \in W(R, U)$; otherwise it is F

(iii) $T(\forall x F(x), (U, W, V)) = T$ iff $T(F(x), (U, W, V')) = T$ for every V' such that (a) $V'(y, U) = V'(y, U)$ for each U and

each individual variable *y* other than *x*; and (b) $V'(x, U') = V(x, U')$ for every U' other than U

The truth-conditions for modal formulas are given using an accessibility relation over universes:

(iv) $T(\Box A, (U, W, V)) = T$ iff $T(A, (U', W, V)) = T$ for every universe U' such that URU'; otherwise it is F.

Kanger notices that by varying the properties of R one obtains truth-conditions for various modalities.

Few things need to be emphasized.

- the interpretation of a variable varies with possible worlds
- in the clause of the universal quantifier, the restriction (b) ensures that the interpretation of *x* is kept constant in all the other universes U' and thus the only variation in the value of the quantified variable *x* can come from V' assigning to *x* different individuals in the universe *U*. Thus this clause guarantees that the range of the universal and existential quantifier is the universe *U*.

Kanger notices that the Barcan formula

$\forall x \Box F(x) \rightarrow \Box \forall x F(x)$

does not hold in his system. We will not run through the technical argument, but mention instead the following informal considerations which illuminates the relationships with Kripke and Hintikka.

Suppose $\forall x \Box F(x)$ is true in the system (U, W, V). Then for every individual $a \in U$ which is assigned to *x*, *a* belongs to the extension of *F* in every alternative universe U': But this does not guarantee that in every alternative universe U' to *U*; all the individuals in U' are in the extension of *F* in U'.

On the other side, the converse of the Barcan formula

$\Box \forall x F(x) \rightarrow \forall x \Box F(x)$

holds. Recall Kripke's counter-example to this formula where we have two universes $U = \{a, b\}$ and $U' = \{a\}$ such that the extension of *F* in each of them is the whole universe and the accessibility relation is universal. We will content ourselves to point out why such a counterexample cannot arise in Kanger's setting.

Consider a system (U, W, V) such that *W* assigns to the predicate symbol *F* in the universe U the same extension F has in Kripke's example, that is, $W(P, U) = \{a, b\}$ and $W(P.U') = \{a\}$. Let *V* be such that $V(x, U) = b$ and $V(x, U') = a$ (recall the condition: $V(x, U) \in U$ for every *U*.) Any other *V* will do the job. It is easy to see that $\forall x F(x)$ is true in both systems (U, W, V) and (U', W, V) and thus by (iv), $\Box \forall x P(x)$ is true in (U, W, V). In order to show that $\Box \forall x F(x)$ is true in (U, W, V) consider any V' which satisfies conditions (a) and (b) of clause (iii). We are not interested in other variables than *x* and thus it is only condition (ii) that matters. We have only two possibilities. $V'(x, U) = V(x, U) = b$, which means, given condition (ii), that we must also have $V'(x, U') = V(x, U') = a$. The other possibility is $V''(x,U) = a$, which, by condition (ii), requires that we must also have $V''(x,U') = V(x, U') = a$. Now it is straightforward to check that $\Box F(x)$ is true in (U, W, V') and in (U, W, V''), that is, $F(x)$ is true in (U, W, V'), (U', W, V'), (U, W, V'') and (U', W, V''). For truth in (U, W, V'), notice that $V'(x, U) = b \in W(F, U) = \{a, b\}$; for truth in (U', W, V') we similarly notice that $V'(x, U') = a \in W(F, U') = \{a\}$; the last two cases are similar. We see that condition (b) is crucial here: it rules out the cases (such as Kripke's counter-example to the converse of the Barcan formula) in which an individual assigned to a free variable *x* does not exist in the universe *U* in which a formula containg an occurrence of *x* is evaluated. In Kanger's models whenever a formula is evaluated in a given universe, all the individual assigned to its free variables exist in that universe. One could perhaps say that the individuals assigned to a free variable in different universes play the role of that variable in those universes. And a similar conception could be defended for individual constants. In this case clause (i) would become $T(a = b, (U, W, V)) = T$ iff $V(a, U) = V(b, U)$ and we would say that $a = b$ is true in (U, W, V) if and only if the individual who plays the role of a in U is the same as the individual who plays the role of *b*.

References:

1. Carnap, R., 1946, Modalities and quantification, The Journal of Symbolic Logic, 11, pp. 33-64.
2. Carnap, R., 1947, Meaning and necessity, Chicago, 1947.
3. Chisholm, R., 1963, 'The Logic of Knowing', Journal of Philosophy 60: 753–795.
4. Chisholm, R., 1967, 'Identity through Possible Worlds: Some Questions', Noûs, 1(1): 1–8.
5. Hintikka, J., 1953, Distributive Normal Forms in the Calculus of Predicates, Acta Philosophica Fennica, reprinted as 'Distributive Normal Form in First-order logic' in J. N. Crossley and M. Dummett, eds. Formal Systems and Recursive Functions, pp. 47-90, 1964.
6. Hintikka, J., 1955, 'Two papers on symbolic logic', Acta Philosophica Fennica, 8.
7. Hintikka, J., 1957a, 'Quantifiers in Deontic logic. Commentationes humanarum litterarum' 23(4), 1-23, Societas Scientiarum Fennica, Helsinki.
8. Hintikka, J., 1957b, 'Modality as Referential Multiplicity', Ajatus 20, 49–64.
9. Hintikka, J.,1961, 'Modality and Quantification', Theoria 27, 119–128.
10. Hintikka, J., 1962/2005, Knowledge and Belief. An Introduction to the Logic of the Two Notions. Ithaca, NY: Cornell University Press. The references here are to the edition prepared by V. Hendriks and J. Symons, 2005.
11. Hintikka, J., 1967a, 'Existence and Identity in Epistemic Contexts', Theoria 33: 138–147.
12. Hintikka, J., 1967b, 'Individuals, Possible Worlds, and Epistemic Logic', Noûs 1: 33–62.
13. Hintikka, J., 1969, 'On the Logic of Perception' in J. Hintikka, Models for Modalities. Selected Essays, Dordrecht: Reidel, pp. 151–183.
14. Hintikka, J. and G. Sandu, 1995, 'The fallacies of the new theory of reference', Synthese, 104, Issue 2, pp 245–283.
15. Hintikka, J., 1998, Paradigms for Language Theory and Other Essays. Selected Papers, volume 4, Kluwer Academic publishers.
16. Kanger, S., 1957, 'New foundations of ethical theory, Stockholm, 1957, reprinted in Hilpinen 1971, pp. 36-58
17. Kripke, S., 1959, 'A completeness theorem in modal logic', The journal of symbolic logic, 24, pp. 1-14.
18. Kripke, S., 1963, 'Semantical considerations on modal logic', Acta philoosphica Fennica, 16, Helsinki, pp. 83-94.
19. Hilpinen, R., 1971 (ed.) Deontic Logic: Introduction and systematic readings, Dordrecht, Holland, 1971.
20. Leblanc, H., 1983, 'Alternatives to Standard First-Order Semantics', in D. Gabbay and F. Guenthner (eds.), Handbook of Philosophical Logic, vol. I, 189-274., D. Reidel Publishing Company.
21. Lewis, C. I., and Langford, C. H., 1932, Symbolic Logic, London: Century. 2nd edition 1959, New York: Dover.
22. Strawson, P. 1953, Reviewed Work: An Essay in Modal Logic by Georg H. von Wright, Philosophy Vol. 28, No. 104, pp. 76-79.
23. Von Wright, G.H., 1951, An Essay in Modal Logic, North-Holland Publishing Company, Amsterdam.

Received Editorial Board 10.04.17

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ВНЕСОК ЯККО ХІНТІКИ В МОДАЛЬНУ ЛОГІКУ В ЙОГО РАННІЙ ПЕРІОД

Ця стаття присвячена внеску Яакко Хінтики в модальну логіку в його ранній період.
Ключові слова: Яакко Хінтика, модальна логіка, історія логіки.

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ВКЛАД ЯККО ХИНТИКИ В МОДАЛЬНУЮ ЛОГИКУ В ЕГО РАННИЙ ПЕРИОД

Эта статья посвящена анализу вклада Якко Хинтики в модальную логику в ранних работах.
Ключевые слова: Якко Хинтика, модальная логика, история логики.

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LEVELS AND TIERS IN ARGUMENTATION

This paper focuses on approach with distinguished two levels of argumentation connected to object-arguments and meta-arguments. In addition, I differentiate three tiers of argumentation (logical, dialectical and rhetorical). Levels and tiers of argumentation are considered from a standpoint of informal logic, a discipline located in the borderland between logic and epistemology. I look at levels and tiers of argumentation, aiming to figure out key features of real argument, which is a subject matter of informal logic.
Keywords: informal logic, real argument, level of argumentation, tier of argumentation, critical question.

1. INTRODUCTION

Argumentation theory has a long history. In my view, the best way to describe its contemporary developments is by considering various theoretical perspectives and approaches. Now, researchers working in various areas investigate the issues of argument. Among them are philosophers, logicians, psychologists, linguists, political scientists, and lawyers. In this regard, it can be presented different opportunities in argumentation studies: theoretical and empirical; analytical and practical; normative and descriptive; formal and informal, etc.

For my present purposes, it is important to stick to the last point on this list, in particular to the informal approaches. The key reason of appearance such approaches was the criticism of formal logic in the late 20th century and their preconditions can be allocated. These are Toulmin's concept of the 'working logic' (Toulmin, 1958) and Perelman's concept of the 'new rhetoric' (Perelman and Olbrechts-Tyteca, 1958).

Toulmin believed that the key problem of formal deductive logic is that it reduces arguments, used in different situation, to universal standards even though the procedure must depend on the realm of knowledge in which they are used. In his opinion, it is necessary to create a new logic similar to epistemology, which has broader subject matter including argumentative process in various spheres of human life and primarily in law. In this respect, he identified formal logic as the 'ideal logic' while informal one is the logic which operates or the 'working logic.'

Perelman believed that rapid development of mathematical logic became the reason why logicians developed mainly the theories of mathematical proof and did not pay attention to the problem of proof in liberal arts. Natural sciences deal with the obvious statements or statements, which may be deduced from their combinations. Unlike them, arts deal with the values. Thus, we cannot use the same proof scheme in natural science and liberal arts. In order to highlight this distinction, Perelman used 'proof' for natural science and 'argument'– for humanities. He held the position that formal logic is the 'logic of proof' and informal logic is the 'logic of argument.'

As a result Toulmin and Perelman concluded that most areas of intellectual and practical activities cannot be limited to formal-logical thinking and require creating a new logic as a theory of argument. Following this idea, Toulmin came up with 'working logic' while Perelman developed 'new rhetoric.'

Nowadays studies in informal theory of argument are topical within the scientific community. A number of different streams can be identified as informal: American tradition of communication studies and rhetoric, linguistic approaches, pragma-dialectical approach, informal logic, etc. I would like to note that my research in argumentation relates to informal logic.

It should be pointed out that various approaches to informal logic have been offered in literature.

"The term *informal logic* does not refer to one well-delineated approach. It rather refers to a collection of attempts to develop and theoretically justify a method for the analysis and evaluation of natural language arguments in different context of use that is an alternative to formal logic (van Eemeren et al., 2015: 374)."

Moreover, there are various suggestions on using other labels as a title for this discipline. For example, 'practical logic', 'philosophy of argument', 'theory of argument', 'applied epistemology', 'theory of reasoning', 'theory of critical thinking', etc.

Because of this, one can occur many interpretations of what informal logic is. The closest to my viewpoint would be the definition, established by Blair and Johnson. It looks as follows.

"Informal logic is the best understood as a normative study of argument. It is the area of logic, which seeks to develop standards, criteria and procedures for the interpretation, evaluation, and construction of arguments and argumentation used in natural language (Blair and Johnson, 1987:148)."

However, I would like to clarify it by considering informal logic as a normative study of such type of argument as real argument.

2. WHAT IS REAL ARGUMENT?

In definition of informal logic I use the term 'real argument' because informal logicians focus solely on this kind of reasoning. Thus, it can be claimed that such argument is a subject matter of informal logic.

Unfortunately, in spite of numerous papers, books, and textbooks published over the last thirty years, consensus as to what a real argument is has not been achieved so far. We can only point out the fact, that the informal logicians

unit around the idea that a real argument is a kind of reasoning which are not a subject matter of formal logic.

This point could be illustrated with Johnson's quote about of one of the vices of formal logic as "virtual disappearance from the mandate of logic of the focus on real argument (Johnson, 2000: 105)." Govier also part companies with Johnson and claims that "what should be obvious: that the understanding of natural arguments requires substantive knowledge and insight not captures in the rules of axiomatized systems (Govier, 1987: 204)."

Let's try to clarify the term 'real argument'. First, it should be pointed out that researchers use various words for this term in informal studies. Among them are real, natural, everyday, actual, real-life, ordinary, mundane, marketplace argument. By now we have witnessed many attempts to produce definition of real argument. However, in my view, none of them is clear enough.

For example, according to Blair and Johnson real argument is: "actual natural language arguments used in public discourse, clothed in their native ambiguity, vagueness and incompleteness. […] arguments that have actually been used to try to persuade people, the sorts of arguments the student will encounter outside the classroom (Johnson and Blair,1994: 6)."

Groarke thinks that real arguments are: the arguments found in discussion, debate and disagreement as they manifest themselves in daily life (Groarke 2016).

Even though it seems that I have provided more than enough definitions for now, still, in my view none of them is clear enough. That is why I will proceed with analyzing real arguments.

With regard to clarifying this term I consider it as complex kind of argument, which is used in argumentation as a form of dialogical interaction, where arguers aim is to resolve a conflict of opinions expressed by verbal means.

In my view, we can highlight the key features of such arguments and it can be described in the following way.

(1) Unlike formal logic, which uses artificial language, real argument is expressed by natural language.

(2) Real argument is a dialogical argument. Here arguing requires at least two arguers. They express to each other divergent points of view on certain question and at the same time should keep in mind objections, which they may have.

(3) Real argument relates to everyday communication. In this regard the artificial reasoning from textbook on logic are not relevant to real arguments.

(4) Real argument mostly is a defeasible argument.We can see that some arguments, which we take to be good, are not sound by reflecting on examples of perfectly acceptable arguments whose premises are not all true, or whose inferential step is not deductively valid.

(5) One of the key features of real argument is its incompleteness. Arguers often do not use all premises and conclusions in such arguments. Some of them do it on purpose of confusing the opponents, but sometimes this case occurs when arguers do not have sufficient skills to express their thoughts clearly.

(6) Real argument is dependent on the context of utterance.

3. LEVELS OF ARGUMENTATION

In my view, based on the analogy from formal logic where object language differs from meta-language, real argument can be analyzed on two levels: object level and meta-level. Let us look closer at both of them.

Begin with explication term 'object level'. Generally, it refers to reasoning about such objects as historical events, social events and politics, news in mass media and social networks, advertising, corporate and governmental communications, personal exchange and practical problems. Such reasoning can be called object-argument.

I see object argument as set of statements that seeks to justify a conclusion by supporting it with premises; to defend it from objections; or both goals.

With regard to the components of object argument, I believe that we can use the traditional approach here: object argument can be considered as a system composed of premises and a conclusion. Conclusion is a statement that is based on other statements, called 'premises'. Both notions are mutually interdependent and hang upon the context of argumentation. Thus, it can be stated that object argument is a claim-reason complex.

The next item on our agenda is to explain the term 'meta-level'. Here I use it with the following meaning: meta-level of argumentation relies on meta-arguments. Meta-argument I see as a reasoning about one or more object-arguments. Object argument in particular discussion is a subject matter of certain meta-argument.

I consider two types of meta-arguments. The first is interpretation of object argument. It can be seen as a description of construction or reconstruction of object argument details in order to ensure their understanding. While we talk about own argument, we concentrate on its construction. In case when we analyze arguments of others, we focus on its reconstruction**.** Another type of meta-argument is object argument's evaluation, namely the assessment of its merits. Method of critical questions can be used in the construction of such arguments.

Meta-arguments represent such tiers of argumentation as logical (LT), dialectical (DT), and rhetorical (RT).

3. TIERS OF ARGUMENTATION

Let us now focus on the issue of defining each of argumentation tiers. Begin with logical tier.

From my point of view it is a neutral-oriented tier of argumentation, which includes meta-arguments about inferential structure of object arguments.

You can ask me why is it neutral-oriented tier? Due to the fact that here argument is considered isolated from arguers, audience and context of argumentation. Remember examples from textbooks on logic. Sometimes they seem so artificial because for training purposes we take them out of context. We are not interested in person who produced these examples and people for whom they were produced. It could even be said that we consider them in some technical sense. As for me in case of logical tier, we do the same.

For further clarifying it could be point out that in case of such tier scholars try to use the meta-arguments for analyzing the object arguments with standpoint of formal logic.

Unlike the previous tier dialectical one is an arguer-oriented tier of argumentation. Here I rely on Johnson's treatment of such term. He defines it in his book "Manifest Rationality" as follows: "In addition to this illative core, an argument possesses a dialectical tier in which the arguer discharges his dialectical obligations (Johnson, 2000:168)."

It is not difficult to find out various clarifications of Johnson's definition that have been proposed by Johnson himself, Finocchiaro (2013), Govier (2000), Hichcock (2002), Hansen (2002), and others. However, generally speaking, dialectical tier in their investigations is connected with the key function of argumentation – rational persuasion.

In the present context the point I would like to stress is that I follow Johnson's idea, however, suggest the following elaboration. First, I consider the dialectical tier as a tier of argumentation, which relate to the interpretation and evaluation of object argument with standpoint as well

as argument's defence from possible criticism of other arguers. It can be objections, observations, counterarguments, refutations, etc.

Rhetorical tier of argumentation analysis is connected with the audience. It is an audience-oriented tier of argumentation, which includes meta-arguments related to the audience reception of argumentation.

Thus from my point of view there are three tiers in argumentation.

(1) Logical tier (LT), which is a neutral-oriented.

(2) Dialectical tier (DT), which is an arguer-oriented.

(3) Rhetorical tier (RT), which is an audience-oriented.

Moving on, let us turn now to further analysis of argumentation tiers. Now I propose to focus on meta-arguments in logical and disputing tears. As the types of such arguments are interpretation and evaluation of object argument.

Interpretation meta-arguments have common features in logical and dialectical tears. They relate to the replies on at least the following critical questions.

(1) How object argument is expressed and stated?

(2) What are its premises?

(3) What is its conclusion?

(4) What missing premises can be included in its reconstruction?

However, interpretation meta-arguments differ in using artificial (formal) language in logical tier and natural one in dialectical tier. Because of this, scholars use various methods for construction or reconstruction of object argument.

In this regard there are critical questions, which are different for logical and dialectical tiers. For example, interpretation in case of logical tier (LT-interpretation) relate to such issues:

(1) What is logical form of object argument?

(2) What is its logical type (deduction, induction, analogy etc.)?

In case of dialectical tier (DT-interpretation) we can notice the following question.

(1) What is the structure of object argument? (serial, linked, independent etc.)

(2) How this structure may be pictured in a structure diagram?

Another aspect of meta-argument is object argument's evaluation, namely the assessment of its merits. Let us turn to criteria approaches.

Here it was suggested by different points for distinction a good argument from a bad one using in logical and dialectical tiers (LT-evaluation, DT-evaluation) . For instance, speaking of traditional logical criteria we can talk about 'soundness' and 'validity.' In general it could be expressed the following way: *an argument is good if and only if it is formally valid and its premises are true*.

By the way it should be noted that only validity is a pure logical criterion because we can identify validity of argument by logical methods. It is not possible to establish whether its premises and conclusion are true or not within logic.

Thus from my point of view criterion of logical evaluation of object argument is validity and hence the LT-evaluation includes the reply first of all on such questions:

(1) Is an object-argument valid/invalid?

(2) Is an object-argument invalid?

The fact that by following validity criterion all the good arguments are being reduced to deductive ones proves how strong it is.

However an argument is good not only it is valid in this technical sense. We can see that some arguments which we take to be good are not sound by reflecting on examples of perfectly acceptable arguments whose premises are not all true, or whose inferential step is not deductively valid. This fact implies that we can use other criteria on dialectical tier of argumentation.

For instance, in this regard informal logicians often are based on a triad of relevance, acceptability and sufficiency (RAS criteria) as a popular set of criteria for evaluation. According to them: *an argument is good if and only if its premises are acceptable, relevant to the conclusion and sufficient to support it.*

I suggest that DT-evaluation at least includes the replies on the following questions:

(1) Are the premises of certain object-argument relevant to the conclusion?

(2) Are the premises of certain object-argument acceptable?

(3) Are the premises of certain object-argument sufficient to support the conclusion?

Concerning meta-argument of rhetorical tier, which as stated above is focused at the audience, it could be noticed that it should include the replies at least on such critical question.

(1) Who is that audience?

(2) What are its values?

(3) How the arguer's argument takes into account the values of the audience?

(4) What rhetorical devices for that do the arguers use?

Here we can talk about rhetorical evaluation of object-argument. For my view this meta-argument (RT-evaluation) refers to value criterion. Generally it could be expressed the following way: *an argument is good if and only if it takes into account the value of the audience.*

4. CONCLUSION

In this paper I have presented my reflections on levels and tiers in argumentation within informal logic. In conclusion I would like to summarize the main points of my paper.

I consider informal logic as a collection of attempts to develop a theory of real argument in different context. Real argument is a complex kind of argument, which is used in argumentation as a form of dialogical interaction, where arguers aim is to resolve a conflict of opinions expressed by verbal means.

In my view the key features of such argument can be described in the following way. It is expressed by natural language; it is a dialogical argument; it relate to everyday communication; it mostly is a defeasible argument; one of the key features of real argument is its incompleteness; it depends on the context of utterance.

Real argument can be analyzed on two levels: object level and meta-level. Object level relies on object arguments, meta-level – meta-arguments. Meta-arguments represent such tiers of argumentation as logical, disputing, and rhetorical. The first is a neutral-oriented, the second is an arguer-oriented, and the third is an audience-oriented.

References:

1. Blair, J. A. & Johnson R. H. (1987). The Current state of informal logic. Informal Logic 9, 147-151.

2. Eemeren, F. H. van & Garssen, B. & Krabbe, E. C. W. & Snoeck Henkemans, F. A. & Verheij, B. & Wagemans, J. H. M. eds (2015). Handbook of argumentation theory. Dordrecht: Springer Reference.

3. Finocchiaro, M. A. (2013). Meta-argumentation. An approach to logic and argumentation theory. London: College publication.

4. Johnson, R. H. (2000). Manifest Rationality. Mahwah, NJ: Lawrence Erlbaum and Associates.

5. Johnson, R.H., & Blair, J. A. (1994), Informal logic: past and present. In New essays in informal logic, 1-19. Winsdor, Ontario, Canada: Informal Logic.

6. Govier, T. (1987). Problems in argument analysis and evaluation. Dordrecht-Holland: Foris Publication.

7. Govier, T. (2000). Critical review; Johnson's Manifest Rationality. Informal Logic, 17, 407-419.

8. Groarke, L. (2016). Informal logic. In Stanford Encyclopedia on Philosophy, http://plato.stanford.edu/ entries/logic-informal/ [accessed 3ed November 2016].

9. Hansen, H. V. (2002). An exploration of Johnson's sense of 'argument'. Argumentation, 16, 263-276.
10. Hichcock, D. (2002). The practice of argumentative discussion. Argumentation, 16, 287-298.
11. Perelman, Ch. & Olbrechts-Tyteca, L. (1958). Traité De L'argumentation: La Nouvelle Rhétorique. Paris: Presses Universitaires.
12. Toulmin, S. E. (1958). The Uses of Argument. Cambridge: Cambridge UP.

Received Editorial Board 12.04.17

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РІВНІ І РЯДИ В АРГУМЕНТАЦІЇ

У цій статті основна увага приділяється підходу з виокремленням двома рівнями аргументації, пов'язаними з об'єктно-аргументами і мета-аргументами. Крім того, я розрізняю три рівня аргументації (логічний, діалектичний і риторичне). Рівні і ряди аргументації розглядаються з точки зору неформальної логіки, дисципліни, розташованої на кордоні між логікою і епістемологією. Я розглядаю рівні і ряди аргументації, прагнучи з'ясувати ключові особливості реального аргументу, який є предметом неформальної логіки.

Ключові слова: неформальна логіка, реальний аргумент, рівень аргументації, ряд аргументації, критичне питання.

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УРОВНИ И РЯДЫ В АРГУМЕНТАЦИИ

В этой статье основное внимание уделяется подходу с выделенными двумя уровнями аргументации, связанными с объектно-аргументами и мета-аргументами. Кроме того, я различаю три уровня аргументации (логический, диалектический и риторический). Уровни и ряды аргументации рассматриваются с точки зрения неформальной логики, дисциплины, расположенной на границе между логикой и эпистемологией. Я рассматриваю уровни и ряды аргументации, стремясь выяснить ключевые особенности реального аргумента, который является предметом неформальной логики.

Ключевые слова: неформальная логика, реальный аргумент, уровень аргументации, ряд аргументации, критический вопрос.

UDC 237.976

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SEMANTIC REPRESENTATION OF INCONSISTENT INTUITIONISTIC THEORIES

In this paper I propose a new method of semantic modeling for intuitionistic logic and provide an intuitive justification to this method. I put in the focus of consideration a concept of intuitionistic theory which is the basic concept of the whole analysis..

Keywords: Intuitionistic logic, state descriptions, constructive truth.

1. Intuitionistic theory

Originally intuitionism has been conceived and usually is treated as a special direction in the foundations of mathematics. Accordingly, one interprets intuitionistic logic as a logic of intuitionistic mathematics. Under this interpretation an intuitionistic theory can only be a mathematical theory, namely a mathematical theory constructed in accordance with the principles of intuitionism. However, one may try to extend the sphere of possible applications of these principles. Why not consider a possibility of a physical or chemical intuitionistic theory?[1] In what follows I understand under an intuitionistic theory *any* theory that fulfills some basic principles of intuitionism and is developed by means of intuitionistic logic. Among these principles are:

(1) interpreting truth as constructive provability (a sentence is intuitionistically true if and only if it is constructively proved);

(2) the principle of preservation for true propositions (a sentence once proved remains such in the future):

(3) rejection of the abstraction of actual infinity and acceptance of the abstraction of potential infinity.

One usually defines a theory as a set of sentences closed under the logical consequence. However, this definition is formulated within a paradigm of classical logic and does not correspond neither to intuitionistic concept of theoretic (scientific) activity nor to the above mentioned general principles of intuitionism. This definition presupposes evidently the abstraction of actual infinity and brings to naught the concept of truth as *constructive* provability.

Thus, it would be more suitable to define an intuitionistic theory as a set of sentences that *should* be closed under the logical consequence. That is, a sentence belongs to an intuitionistic theory (to some moment *a*) if and only if it is *actually* proved within this theory (to this moment). In this way we obtain a possibility to reflect the process of development of our knowledge and to distinguish between different stages of a theory.

2. The statements *of* a theory and the statements *about* a theory

Consider some intuitionistic theory. We should strongly distinguish between the statements of this theory itself and the statements by which we describe a state of the theory to some moment. This distinction corresponds to distinction between an object language and a metalanguage. Take some sentence formulated in the object language, say *A*. We have the following criterion – *A* belongs to our theory (to some moment) – *A* is true – if and only if *A* is proved within this theory (to this moment). Using the expressions of a metalanguage, we may describe the situation that takes place in the given theory. There are only two kinds of such expressions possible – either *positive* or *negative*. Namely, relative to any sentence *A* we may state either "*A* is proved in the given theory" or "*A* is not proved in the given theory".

Note that the negation in the later metadescription is not a negation of the object intuitionistic language. Moreover, this negation is essentially of classical character. The statements of the metalanguage do not obey generally the principle of truth-preservation, in particular the negative statements do not. In fact, a sentence can be not proved now, but the proof we need can be found later. Unlike this, the negative statements of intuitionistic theories should be

[1] Remember in this connection the "constructive theory of science" by P. Lorenzen and W. Kamlah ("Erlangener Schule").

of constructive type subject to the principles (1) – (3) above (and maybe some other principles).

Thus, we have *two* different kinds of negation – the object language negation which is applicable to the sentences of an intuitionistic theory and the metalanguage negation dealing with the statements by which we describe the theory. Consider our sentence *A* again. The object language (intuitionistic) negation of such a proposition has to be expressed in the form "*A* is refuted", or – as it is generally accepted in intuitionism – "assertion of *A* leads to a contradiction". A metalanguage negation of the proposition is, as against, simply "*A* is not proved".

3. The factual negation. Intuitionistic state-descriptions

The above distinction between two kinds of negation is a generalization of Heyting's distinction between "mathematical" and "factual" negations that can be found in [Heyting 1956]. Below is the full length corresponding passage from that work (italics are mine):

"Strictly speaking, we must well distinguish the use of 'not' in mathematics from that in explanations which are not mathematical, but are expressed in ordinary language. In mathematical assertions no ambiguity can arise: 'not' has always the strict meaning. 'The proposition *p* is not true', or 'the proposition *p* is false' means 'If we suppose the truth of *p*, we are led to a contradiction'. But if we say that the number-generator r which I defined a few moments ago is not rational, this is not meant as a mathematical assertion, but as *a statement about a matter of facts*; I mean by it that as yet no proof for the rationality of r has been given. As it is not always easy to see whether a sentence is meant as a mathematical assertion or as a *statement about the present state of our knowledge*, it is necessary to be careful about the formulation of such sentences. Where there is some danger of ambiguity, we express the mathematical negation by such expressions as 'it is impossible that', 'it is false that', 'it cannot be', etc., while *the factual negation* is expressed by 'we have no right to assert that', 'nobody knows that', etc.

There is a criterion by which we are able to recognize mathematical assertions as such. Every mathematical assertion can be expressed in the form: 'I have effected the construction *A* in my mind'. The mathematical negation of this assertion can be expressed as 'I have effected in my mind a construction *B*, which deduces a contradiction from the supposition that the construction *A* were brought to an end', which is again of the same form. On the contrary, *the factual negation* of the first assertion is: 'I have not effected the construction *A* in my mind'; this statement has not the form of a mathematical assertion." [Heyting 1956, 18-19].

To sum up: the *mathematical* negation by Heyting is the intuitionistic negation proper which can occur in intuitionistic theories. The *factual* negation is a metalanguage negation that belongs to a metalanguage used for describing intuitionistic theories.

Now I employ the principle of compositionality according to which any complex expression can be reduced to its constituents up to the very simple expressions. Taking as a philosophical postulate, this principle tells us that the world can be completely described on the level of atomic facts only. R. Carnap implemented this idea in semantic analysis by means of *state-descriptions* (see [Carnap 1988]). Applying this idea to the concept of intuitionistic theory, we may suppose that for a complete description of a state of some theory *a* to a certain moment, we can confine ourselves by listing all those atomic sentences that are proved in *a* to this moment as well as all those atomic sentences that are not proved in *a* to this moment.

In this way we arrive at the concept of intuitionistic state-description.

Let "~" be the negation of intuitionistic object language, and let "Ø" be factual negation used for describing the states of an intuitionistic theory.

Let **V** be the set of all atomic sentences of the language together with their factual negations: {p_1, Øp_1, ... , p_n,, Øp_n, ...}.

Definition 3.1.

a is an *intuitionistic state-description* (i.s.d.) if and only if

(i) *a* Í **V**;

(ii) for any p_i: p_i Î *a* or Øp_i Î *a*.

If *a* is some i.s.d., then "p_i Î *a*" means "p_i is proved in the theory determined by *a*", and "Øp_i Î *a*" means "p_i is not proved in the theory determined by *a*". Thus, any i.s.d. describes (on the level of atomic sentences) a state of some intuitionistic theory at some moment. Intuitionistic state-descriptions are "epistemic" *alter ego* of classical state-descriptions introduced by Carnap, with the difference that i.s.d. are descriptions of our knowledge rather than the "objective" world.

Generally the factual negation "Ø" as a component of i.s.d. is *not* equal to the negation of our metalanguage. Every occurrence of factual negation is of course an occurrence of metalanguage negation, but not *vice versa*! In general case metalanguage negation can be applied to any expression of the metalanguage, whereas the factual negation can be used only on the level of *facts* (i.e. can be applied only to atomic sentences). Thus, the factual negation "Ø" is a particular case of metalanguage negation. Taking into account the principle of compositionality, I suppose that such a factual negation is enough for complete description of any intuitionistic theory.

4. Two concepts of proof. Inconsistent state descriptions

Note, that condition (ii) of definition 3.1 demands that i.s.d. must be *complete* with respect to factual negation. Now the problem of inconsistency arises: it is *not* generally required that i.s.d. have to be *consistent* with respect to factual negation, that is, I *do not* take the condition

(iii) p_i Ï *a* or Øp_i Ï *a*.

This may seem to be very strange: taking into account the underlying intuitive interpretation, this means that a situation can appear when some sentence is and is not proved simultaneously. How can it be? Some primary intuitive ideas – first of all the law of contradiction – seems to be afforded. I believe however that this situation can be explained in an intuitively satisfactory way, and this can be done just in accordance with the Heyting's understanding of mathematical (object language) and factual (metalanguage) negations, and my interpretation proposed above.

For the sake of simplicity I confine myself with a consideration of axiomatic theories. Let us first spell out the meaning of the expression "p_i Î *a*". It means that a proof of p_i (in theory *a*) is given, that is – according to the tradition – there is a sequence of sentences such that any sentence from the sequence is either axiom of *a*, or is obtained by inference rules, and the last sentence of the sequence is p_i.

Now, if we wish that i.s.d. describe real intuitionistic theories, we have to take into consideration the fact of existence of *inconsistent theories*. This fact simply takes place, our theories – regardless whether we wish this or not – can be and often really are inconsistent. In this light the following question arises:

What is the proper semantic representation of the situation, when a sentence is proved within an inconsistent theory?

Let us take the following definition: an intuitionistic theory is inconsistent if and only if there is a sentence *A*, such that *A* is proved in it, and *~A* is proved in it. Consider now a theory which is inconsistent with respect to p_i. That is, the proofs of both p_i and $\sim p_i$ in the theory are given: there is a sequence of sentences such that any sentence from the sequence is either axiom of a theory, or is obtained by an inference rule, and the last sentence of the sequence is p_i, and there is a sequence of sentences such that any sentence from the sequence is either axiom of a theory, or is obtained by an inference rule, and the last sentence of the sequence is $\sim p_i$. But the last observation means that *in fact* p_i is not proved, i.e. that the above mentioned "proof" (sequence of sentences) for p_i *proves nothing*! However, this "proof" *is still present* in our theory (as long as our theory is contradictory). Thus, we have an interesting metatheoretical situation – *formally* we have a proof of p_i, but this proof does not prove p_i, so, *actually*, we do not have a proof of p_i.

This argument can be easily reconstructed so that it does not contain any explicit reference to the object-language negation. Let us take (as Heyting does) the notion of contradiction as a primitive notion, and let us define a contradictory theory as a theory that includes some self-contradictory sentence (e.g., 1 = 2) as a theorem. Again, if a sentence p_i is proved in such a theory, then, of course, we do have a formal proof of p_i, but nevertheless, we cannot seriously state that p_i is really proved (because the theory, where the proof of p_i is given, is contradictory and as such incredible).

We should clearly distinguish between two different meanings of the expression "p_i is proved" – the *merely formal* one and the *real* one. From a formal point of view to say "p_i is proved" means to say "there is a sequence of sentences such that ... etc." (as above) and nothing more than that. But if an intuitionist says "p_i is proved" (having in mind a real meaning of the term) she/he means that p_i is *intuitionistically true* (and this of course cannot be the case, when p_i is self-contradictory).

This distinction can also be explicated as a distinction between a *weak* notion of proof (a formal proof in the theory is given), and a *strong* notion of proof (a formal proof in the theory is given, *and* the theory is consistent). Correspondingly, the expression "p_i is not proved" can be used in two senses: either (1) there is no formal proof of p_i in the given theory, or (2) there is no formal proof of p_i in the given theory, or the theory is inconsistent. The second meaning reflects an understanding that *any formal proof of p_i in a contradictory theory cannot be considered a real proof of p_i*.

Using the terminology of i.s.d., I interpret (1) as p_i Ï *a*, and (2) as Øp_i Î *a*. It is clear that (1) Þ (2), but not *visa versa*! This is why I take the condition (ii) but do not take (iii). I also interpret the expression p_i Î *a* as "there is a formal proof of p_i in theory *a*".

Taking into account either absence or presence of a formal proof of p_i in the theory *a*, and either consistency or inconsistency of *a* itself, the following four situations are possible:

I. (a) there is no formal proof of p_i in theory *a*, and *a* is inconsistent;

(b) there is no formal proof of p_i in theory *a*, and *a* is consistent.

II. (a) there is a formal proof of p_i in theory *a*, and *a* is inconsistent;

(b) there is a formal proof of p_i in theory *a*, and *a* is consistent.

As noted above, if we have no formal proof of a sentence, then the real proof of the sentence is absent anyway, regardless whether the theory is consistent or not. That is, I(a) and I(b) can be interpreted as single case. However, if we have a formal proof of a sentence, we have to take into account the factor of consistency of the theory to get to know whether the sentence is really proved or not. It means that the cases II(a) and II(b) have to be interpreted separately. All these cases can be adequately described by means of combinations of expressions p_i Î *a*, Øp_i Î *a*, p_i Ï *a* and Øp_i Ï *a* alone. Here are these descriptions:

I(a) – (b): If there is no formal proof of p_i in theory *a*, so it means that there is no proof of p_i in *a* at all, hence, p_i Ï *a* and Øp_i Î *a*.

II(a): p_i is formally proved in *a*, but not really. Thus, there is a formal proof of p_i in *a*, however, there is no real proof of p_i in *a*: p_i Î *a* and Øp_i Î *a*. Then we have: there is a formal proof of p_i in *a*, and (there is no formal proof of p_i in *a*, or *a* is inconsistent). As a result, using the rule of *disjunctive syllogism*, we get – "the theory *a* is inconsistent"! So, contradictory i.s.d. {p_i, Øp_i} serves as the adequate semantic representation of a contradictory intuitionistic theory.

II(b): p_i is really proved in the theory *a*: p_i Î *a* and Øp_i Ï *a*.

I summarize these descriptions in the following table:

p_i is not formally proved in *a*	there is no formal proof of p_i in theory *a*	p_i Ï *a* and Øp_i Î *a*; *a* = {Øp_i}
p_i is formally proved in *a*, but not really	there is a formal proof of p_i in theory *a*, and *a* is inconsistent	p_i Î *a* and Øp_i Î *a*; *a* = {p_i, Øp_i}
p_i is really proved in the theory *a*	there is a formal proof of p_i in theory *a*, and *a* is consistent	p_i Î *a* and Øp_i Ï *a*; *a* = {p_i}

One may notice that *in fact* contradictory i.s.d. – under such an interpretation – are not contradictory at all. Yes, they are not. I would like to stress that "contradictory" i.s.d. are not contradictory itself, they only *represent* the contradictory theories. An i.s.d. *a* would have been *really* contradictory, if we would have p_i Î *a* and p_i Ï *a*. But this is impossible, because the whole semantic construction would have turned then into nonsense. Introduction of factual negation helps to solve a sophisticated technical problem – to represent inconsistent theories in a non-contradictory way. In other words, the factual negation proves to be a very suitable technical tool for representing inconsistent theories on the semantic level. Contradictory i.s.d. provide a construction where the strong and the weak concepts of proof can be combined. If we have {p_i, Øp_i}, it simply means: "Although we have a formal "proof" of p_i, nevertheless p_i is not true (because the theory, where the "proof" was given, is contradictory)".

Notice, that the interpretation of factual negation given above perfectly corresponds to Heyting's understanding of the factual negation. Heyting writes that factual negation can be expressed as "we have no right to assert that". But this is exactly the case (2) described above – we have no right to assert p_i if and only if either no formal proof of p_i is given or such a proof is given in a contradictory theory.

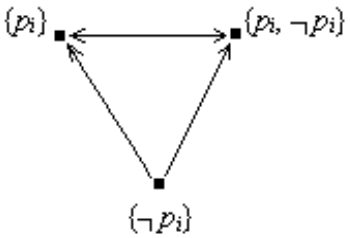
5. A general model for intuitionistic theories

The definition of intuitionistic theory given in the section 1 implies that we should be able to observe a development of our theoretical knowledge in the course of time. The apparatus of i.s.d. gives an excellent opportunity for reflecting this idea. Namely, we may introduce a binary relation R between intuitionistic states-descriptions as follows:

Definition 5.1.
R*ab* Û a^+ Í b^+ [a^+ (b^+) is the "positive" part of *a* (*b*), i.e. a^+ (b^+) is that and only that part of *a* (*b*) which consists of the variables without metanegations].

Informally relation R can be interpreted as a possible time-relation between different states of some theory, i.e., R*ab* means that theoretical construction *b* is a result of possible development of theoretical construction *a*. It is easy to see that R is reflexive and transitive.

With respect to every atomic sentence p_i only the following three i.s.d. are possible: {Øp_i}, {p_i}, {p_i, Øp_i}. These i.s.d. are ordered by the relation R as follows:



Now I introduce a *general model for intuitionistic logic* (G-model), on the base of intuitionistic state-descriptions as a triple < W, R, Ç >, where W is a non-empty set of i.s.d., R is a binary relation on W defined as above, and Ç is a *forcing relation* between i.s.d. and formulae of the language. The expression "*a* Ç *A*" means "i.s.d. *a forces us* to accept the sentence *A*", or according to the informal explanations given above "the sentence *A* is proved within a theory determined by *a*". The following definition introduces the forcing relation for atomic and positive complex sentences:

Definition 5.2.
a Ç p_i Û p_i Î *a*;
a Ç A & B Û *a* Ç A and *a* Ç B;
a Ç A v B Û *a* Ç A or *a* Ç B;
a Ç A É B Û "*b* (R*ab* Þ (*b* Ç A Þ *b* Ç B)).

One can easily show that the principle of truth-preservation holds both for atomic and for complex sentences.

Finally, I would like to point out that inconsistent intuitionistic state-descriptions are not only of pure theoretic interest, but can be effectively employed in some key semantic definitions. A remarkable feature of the semantic model proposed above, is that it allows to define intuitionistic negation in a very natural way. As it was already mentioned at the beginning of the paper, the traditional approach to informal understanding of the negation operation in intuitionism is that any sentence ~*A* can be considered true if and only if an assumption that *A* is true leads us to contradiction. Exactly such an understanding is presented in the citation from [Heyting 1956] above. Thus, the operation of negation is reduced to the notion of contradiction. Heyting wrote that "contradiction must be taken as a primitive notion. It seems very difficult to reduce it to simpler notions..." [Heyting 1956, 98]. However, it appears that constructing semantics in terms of intuitionistic state-descriptions, allows to introduce the notion of contradiction *by definition*. Let "con(*a*)" means "intuitionistic state description *a* is contradictory". Then we may consider the following definition:

Definition 5.3.
con(*a*) Û $$p_i$ (p_i Î *a* and Øp_i Î *a*).

Now the forcing relation for negation can be defined as follows:

Definition 5.4.
a Ç ~A Û "*b* (R*ab* Þ (*b* Ç A Þ con(*b*))).

This definition *literally reproduces* the informal understanding of negation operator described above. It is also interesting that by means of this definition the *minimal negation* of [Johansson 1936] is adequately defined. To obtain the negation of Heyting's intuitionistic logic, we have to introduce the notion of absolute contradictory i.s.d. *a* (abcon(*a*)):

Definition 5.5.
abcon(*a*) Û "p_i (p_i Î *a* and Øp_i Î *a*),

and to accept the following condition:

Condition 5.6.
con(*a*) Þ abcon (*a*)

This condition validates the characteristic axiom of intuitionistic logic:

EFQ. ~A É (A É B).

Taking further conditions we may get the definitions of other negations of intuitionistic type, cf. [Shramko 1997a], [Shramko 1997b].

References:
1. Carnap, R. Meaning and Necessity A Study in Semantics and Modal Logic. Second edition, Chicago and London (The University of Chicago Press), 1988 (First edition – 1947)
2. Heyting A. Intuitionism an Introduction, Studies in Logic and Foundations of Mathematics, Amsterdam, 1956
3. Johansson I. Der Minimalkalkül, ein reduzierter intuitionistischer Formalismus, Compositio Math., 4, 1936, pp. 119-136
4. Shramko, Y. Time and Negation // Faye, J., Scheffler, U., and Urchs, M. (eds.) Perspectives of Time. Dordrecht / Boston / London (Kluwer Academic Publishers), 1997, pp. 399-416
5. Shramko, Y. "Semantics for constructive negations", UPPP, University of Uppsala, 1997, no 9, pp. 1-28.

Received Editorial Board 11.04.17

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СЕМАНТИЧНА РЕПРЕЗЕНТАЦІЯ НЕСУМІСНИХ ІНТУЇЦІОНІСТСЬКИХ ТЕОРІЙ

У цій статті я пропоную новий метод семантичного моделювання для интуиционистской логіки і забезпечую інтуїтивне обгрунтування цього методу. Я поставив в центр уваги концепцію интуиционистской теорії, яка є базовою концепцією всього аналізу..

Ключові слова: Інтуїціоністська логіка, опис станів, конструктивна правда.

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СЕМАНТИЧЕСКОЕ ПРЕДСТАВЛЕНИЕ НЕПОСЛЕДОВАТЕЛЬНЫХ ИНТУИЦИОНИСТСКИХ ТЕОРИЙ

В этой статье я предлагаю новый метод семантического моделирования для интуиционистской логики и обеспечиваю интуитивное обоснование этому методу. Я поставил в центр внимания концепцию интуиционистской теории, которая является базовой концепцией всего анализа.

Ключевые слова: Интуиционистская логика, описания состояний, конструктивная правда.

УДК 16 : 001.89

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НАУКА ЛОГІКИ МОДИ 2?

Загальний стан і проблеми викладання логіки в університетах досліджено з огляду на підхід ГІббонса – Новотни. Експліковано основний зміст цього підходу і показано, що наразі наука логіки по суті відповідає "умовам Моди 1", тоді як перспективи її поступу полягають у адаптації до "умов Моди 2". Одним з моментів такої адаптації має бути контекстуалізація науки логіки, яка стосуватиметься не тільки процесу виробництва знань, а й почасти їх змісту та викладання.

Ключові слова: наука логіки, наука Моди 2, суспільство Моди 2, загальна логіка, матеріальна логіка.

У другому десятилітті XXI століття на частині пострадянського простору, включаючи Україну і Росію, освітній статус логіки не можна визнати задовільним. До такого висновку приводить, зокрема, аналіз серії статей з теми логічної освіти, опублікованих нещодавно в авторитетному журналі "Філософські науки". Серед чинників, що детермінують пониження освітнього статусу логіки, В. О. Бажанов і В. І. Маркін, І. В. Хоменко вказали приєднання України й Росії до Болонського процесу. В ході відповідних перетворень логіка трансформувалась у "дисципліну за вибором", втративши в навчальних планах гарантію не тільки розумних "годин", а й навіть існування. Вона регулярно програє іншим "дисциплінам за вибором", опиняючись на маргінесі навчального процесу, і т. ін. [Бажанов і Маркін 2013, 106-107]; [Хоменко 2013, 111-112] [Тягло 2013, 129-130]. Та коли згадати розповсюджену метафору про освіту – дзеркало суспільства, то низький університетський статус логіки – більш або менш точний відбиток слабкості її загальної соціальної позиції.

Представники вченої спільноти зазвичай – і не безпідставно – пояснюють описану ситуацію зовнішніми чинниками: не тільки вимогами Болонського процесу, а і традиційною зацикленістю деканатів на "профілюючих дисциплінах", "урізанням політичних і економічних свобод" у деяких країнах тощо [Бажанов і Маркін 2013, 109]. Не піддаючи сумніву важливість врахування цих і подібних до них чинників, не можна нехтувати й іншими, пов'язаними власне з наукою логіки.

Наразі обмежусь тільки одним зауваженням. У виданому у 1800 році посібнику Іммануїл Кант запропонував визначення, за яким логіка є "апріорна наука про необхідні закони мислення, але не по відношенню до окремих предметів, а усіх предметів загалом; отже – наука про правильне застосування розсудку і розуму взагалі… за принципам a priori…" [Кант 1980, 323-324]. Однак раніше – у "Критиці чистого розуму" – Кенігсбержець визнав, що логіку "можна брати в двоякому плані: як логіку або загального, або особливого вживання розсудку. Перша містить цілком необхідні правила мислення, без яких не відбувається жодного вживання розсудку, і, отже, стосується до нього без огляду на відмінності предметів, на які він може бути скерований. Логіка особливого вживання розсудку містить правила [щодо того, як] коректно мислити про якийсь певний вид предметів. Першу можна назвати елементарною логікою, а другу – органоном тієї чи іншої науки" [Кант 2000, 77]. Тож, за Кантом, загальна, або формальна, логіка не вичерпує науку логіки, припускаючи "логіку особливого вживання розсудку", віднесену до розгляду "певного виду предметів".

Хоча сьогодні Кантів апріоризм вважається здоланим, логіку ще часто подають як цілком незалежну од предмету мислення і, так би мовити, прикладену до нього ззовні науку. А дехто, спрощуючи чи навіть спотворюючи Канта, вважає не тільки *необхідним*, а і *достатнім* вивчати мислення та викладати науку про нього без жодного співвіднесення з багатоманітними "предметами певного виду". Але таке розуміння зіштовхується з труднощами, почасти вже згаданими вище.

Вельми переконливу констатацію педагогічних негараздів такого розуміння логіки дав Мартін Гайдеггер у лекціях, прочитаних у Марбурзькому університеті ще у 1928 році. Ця логіка, що вперто викладається професорами, нічого не говорить студентам, зауважив знаменитий автор "Буття і ніщо". Вона суха, наче пил, вона збиває студента з пантелику. Студент не знаходить зв'язку між цією логікою і своєю академічною підготовкою. Ніяк не зрозуміти, яка від неї користь… [Heidegger 1984, 5].

Тож чи не в претензії на *довершену всезагальну нормативність*, якій багатоманітність реальності й варіативність досвіду її освоєння конкретними людьми за конкретних умов, по суті, байдужі, криється глибинний виток маргіналізації абсолютизованої "елементарної логіки"? Моя стаття присвячена пошуку відповіді на поставлене питання з огляду на фундаментальні зміни у світовій науці другої половини XX – початку XXI століття.

Наука Моди 2

Світова наука знаходиться у процесі суттєвих змін, на осмислення яких спрямовані різного роду дослідницькі підходи. Один з них представлений книгою "Нове виробництво знань. Динаміка науки і досліджень у сучасних суспільствах", опублікованою у 1994 році групою авторів на чолі з британцем Майклом Гіббонсом. Та всупереч світовій експансії цього підходу для вітчизняної спільноти вчених він дотепер залишається майже суцільною "білою плямою". Тож аби мати змогу спертися на нього як на основу осмислення наявного стану науки логіки, коротко проаналізую його основний зміст.

Базова ідея команди Гіббонса полягала у тому, що протягом останніх десятиліть відбувається трансформація способу виробництва знань (mode of knowledge production), яка охопила природничі, соціальні і гумані-

тарні науки, а також технологію. Вихідний стан цього процесу одержав назву "Мода 1" (Mode 1), а кінцевий – "Мода 2". Перелік характерних особливостей Моди 2 включав п'ять основних пунктів: 1) знання виробляються у контексті застосування (a context of application); 2) трансдисциплінарність; 3) гетерогенність і організаційне різноманіття; 4) соціальна підзвітність і рефлексивність; 5) новий контроль якості [Gibbons et al. 1994, 1-3]. Результат тривалого обговорення і прояснення вказаних особливостей представлений у книзі Хельги Новотни, Пітера Скотта та Майкла Гіббонса 2001 року [Nowotny et al. 2001], а також у їхніх статтях [Nowotny et al. 2003] і [Nowotny et al. 2006]. Далі спиратимуся на вивченні саме цих – відносно зрілих – праць нової конфігурації авторів, яку називатиму командою Новотни.

Знання Моди 2 генеруються у контексті застосування. Це відрізняється від процесу застосування, коли "чиста" наука, одержана у теоретичному / експериментальному середовищі, "застосована"; технологія "перенесена"; з часом знання "спрямоване". Навпаки, заявляють Новотни, Скотт і Гіббонс, контекст використання – це цілісне середовище, в якому виникають наукові проблеми, розробляються методології, розповсюджуються результати, визначається їх застосування.

Другою характерною особливістю Моди 2 виявляється трансдисциплінарність, що розуміється як мобілізація для вирішення проблем низки теоретичних поглядів і практичних методологій. Однак, на відміну від інтер- або мульти-дисциплінарності, вона не виводиться з необхідністю з раніше відомих дисциплін і не завжди призводить до формування нових. Творчий акт не менше полягає у спроможності мобілізувати і направити погляди та методології, у їх "зовнішній" оркестровці, ніж у розвитку нових теорій, концептуалізацій та в удосконаленні дослідницьких методів, у "внутрішній" динаміці наукової креативності. Конфігурація дослідників й інших учасників варіюється, часто породжуючи плинні особливості робочого стилю Моди 2. Команди збираються і після виконання роботи розпадаються з тим, аби відродитися в іншій конфігурації для розв'язання наступної задачі. Інакше кажучи, знання Моди 2 – у такій трансдисциплінарній формі – закарбоване у досвіді окремих дослідників і дослідницьких команд так само сильно, а, можливо, і сильніше, як воно викладене у звичних наукових продуктах на кшталт журнальних статей чи патентів [Nowotny et al. 2006, 41], [Nowotny et al. 2003, 186].

Третя особливість Моди 2 полягає у набагато більшій різноманітності площадок виробництва знань і у пов'язаній з цим зростаючій гетерогенності типів знаннєвої продукції. Можна аргументувати, погоджуються автори, що перше явище не особливо нове. Наукові спільноти завжди були "віртуальними", такими, що долають національні й культурні межі. Але змінилась динаміка. Раніше взаємодія усередині таких спільнот обмежувалась низкою факторів – фізичних (можливість зустрічатися) та технічних (листи й телефони). Сьогодні ж, завдяки прогресу інформаційно-комунікаційних технологій, взаємодія практично нічим не обмежена і миттєва. Впорядковані ієрархії, нав'язані "старими" технологіями взаємодії, руйнуються комунікаційною загальнодоступністю. Описаний зсув інтенсифікується тим, що межі дослідницьких спільнот наразі відкриті, допускаючи багато нових видів "знаннєвих" організацій на кшталт мозкових центрів, консультантів з питань управління, груп активістів, котрі включаються у "дослідницькі ігри". Всезагальне проникнення інформаційно-комунікаційних технологій підтримує й активує далі процес соцієтального розподілу знань, примноження площадок їх виробництва [Nowotny et al. 2006, 41-42], [Nowotny et al. 2003, 187].

Четверта особливість Моди 2 в рамках досліджуваного підходу вбачається у тому, що вона є вельми рефлексивною. Єдиний епістемологічний ідеал нейтральної "точки зору з нівідкіль" замінений визнанням множини точок зору, кожна з яких десь локалізована. Процес дослідження надалі не може бути охарактеризований як "об'єктивне" пізнання природного (або соціального) світу, тобто безпристрасне редукціоністське дослідження довільно визначеного "іншого". Він перетворюється на діалогічний процес, інтенсивну (і, можливо, безкінечну) "розмову" між дослідниками та предметами досліджень – до такої міри, що базовому словнику дослідження – хто, кому / чому, що, як – загрожує втрата значимості... Середовища розв'язання проблем впливають на вибір тем й на замисли досліджень так само, як і кінцеві цілі використання [Nowotny et al. 2006, 42], [Nowotny et al. 2003, 187].

П'ятою характерною особливістю Моди 2 стверджується виникнення новаторських форм контролю якості. Обмеження традиційної, тобто дисциплінарно-обґрунтованої системи експертної оцінки вже відомі. По-перше, для знань Моди 2 наукові "експерти" не можуть бути встановлені надійно, адже стійкої таксономії кодифікованих дисциплін, що поставляла б таких "експертів", більше не існує. По-друге, редукціоністські форми контролю якості не можуть бути легко застосовані у випадку набагато ширше окреслених дослідницьких питань: до дослідницької "гри" залучається все більше гравців – не просто ширший і еклектичніший ряд "виробників", а і організатори, посередники, розповсюджувачі та користувачі. По-третє, і це викликає найбільше занепокоєння, ясні й беззаперечні критерії визначення якості надалі можуть виявитися недосяжними. Хоча наукова досконалість (у якийсь спосіб визначена) залишається необхідною, проте зрозуміло, що мають бути долучені й додаткові критерії – економічні, політичні, соціальні чи культурні. Це означає, що нам слід вчитися жити з множиною визначень якості: даний факт серйозно ускладнює процеси диференціації, встановлення пріоритетів, відбору, на які мають покладатися ті, хто визначає політику й здійснює фінансування [Nowotny et al. 2006, 42], [Nowotny et al. 2003, 187-188].

Порівняльний аналіз репрезентативних публікацій розглядуваного підходу дозволяє стверджувати, що п'ять основних характерних особливостей Моди 2, вказаних у 1994 році командою Гіббонса, протягом наступного десятиліття були прояснені та усталились. Тим самим встановлено підстави ідентифікації науки Моди 2.

Наука суспільства Моди 2

У 2001 році побачила світ книга "Переосмислюючи науку: знання і публіка в епоху невизначеності". Її головна мета визначена як переосмислення науки у динамічному зв'язку з суспільством. Аргументація команди Новотни у найпростішому вигляді може бути зведена до наступних тверджень.

Наука Моди 2 знаходить розвиток у контексті суспільства Моди 2 (a Mode-2 society), яке долає обмеженість розділення модерності на дискретні домени на кшталт політики, культури, ринку і, звичайно ж, науки та суспільства. Тож за умов Моди 2 (Mode-2 conditions) наука і суспільне буття стають трансгресивними областями активності, що взаємно перемішані й реалізують ко-еволюційні тренди [Nowotny et al. 2001, 3-4].

Ключове поняття Моди 2 одержує розширену область визначення: воно вже схоплює стан не тільки виробництва науково-технологічних знань, а й усього сучасного суспільства. Тому наука Моди 2 перестає видаватися "білою вороною" у порівнянні з рештою частин соціуму, оскільки всі вони тепер стверджуються відповідними загальним "умовам Моди 2". А визначальною серед цих умов виявляється відмова від класичної моделі суспільства Модерну – сукупності взаємодіючих, проте ок-

ремих доменів: тепер вони визнаються існуючими як частини органічного цілого. Справді, вони нероздільні (трансгресивні, розмиті) й взаємно узгоджені у своєму функціонуванні чи розвиткові (ко-еволюціонують).

Наш висновок полягає у тому, стверджували автори книги 2001 року, що більш щільна взаємодія науки і суспільства призводить до виникнення нового виду науки: контекстуалізованої, або чутливої до контексту (contextualized, or context-sensitive) [Nowotny et al. 2001, vii]. Важливо зауважити, що трактовка чутливості до контексту у 2001 році ширша і багатша за змістом, ніж відзначене у 1994 році виробництво знань у контексті застосування (див. докл., напр., [Тягло 2016]). У зв'язку з розширеним і збагаченим розумінням чутливості науки "до широкого публічного простору" цілком природною видається концептуальна новація команди Новотни – поняття "соціально добротних знань" ("socially robust knowledge"). Надійні знання (reliable knowledge) – традиційна мета наукового дослідження – надалі не являються "(само?)достатніми" у більш відкритому знаннєвому середовищі, що постає сьогодні. Знання мають бути "соціально добротними" ще й остільки, оскільки їхня валідність більше не детермінована виключно, або головним чином, вузько обмеженими науковими спільнотами. Натомість вони детерміновані набагато ширшими спільнотами, котрі включають також зчеплення виробників, розповсюджувачів, торговців і користувачів знань [Nowotny et al. 2003, 191-192]. До цього фрагменту статті 2003 року у близькому за змістом фрагменті публікації 2006 року було добавлене одне речення: "У порівнянні з надійними знаннями соціально добротні знання не є ані менш просунутими, ані менш досконалими; можливо, вони є вищими (superior)" [Nowotny et al. 2006, 49].

Тож контекстуалізація науки природно проявляється у тенденції переходу від науково надійних знань до соціально добротних. При цьому соціальна добротність не пов'язана з якоюсь вульгаризацією чи "дурним запереченням" наукової надійності, тут слід скоріше говорити про більшу відкритість в буття й про долання спрощень, котрі припускалися раніше. Можна сказати і так: повнота опису науки підвищується через врахування не тільки її самої по собі, а й оточуючого соціального середовища.

Проведений аналіз показує, що у розвитку започаткованому командою Гіббонса підходу команда Новотни здійснила суттєвий зсув – від виявлення й опису низки характерних особливостей науково-технологічного виробництва знань Моди 2 до його пояснення на основі констатації коеволюції науки та суспільства "в напрямку Моди 2". При цьому поняття Моди 2 одержало вельми широку область визначення, схоплюючи вже не тільки науку чи технологію, а й усе сучасне буття суспільства. Виробництво наукових знань Моди 2 було визнане чутливим до соціуму Моди 2 в цілому. Органічним зв'язком різних доменів всеохоплюючої соціальної системи наших днів, що породжує небачені раніше "простори трансакцій", "торгівельні зони" и т. ін., пояснена оригінальність "нового виробництва знань", його характерні відмінності від функціонування науки Моди 1, типової для Модерну.

На шляху до науки логіки суспільства Моди 2?

У термінах підходу Гіббонса – Новотни наведене на початку статті визначення логіки Кантом піддається ідентифікації як рефлексія науки Моди 1, науки суспільства Модерну. Для дійсної контекстуалізації науки, вимоги соціальної добротності знань і тому подібних речей у другій половині XVIII століття достатніх підстав ще не було, тому тогочасні роз'яснення Кенігсбержця не викликають беззаперечного неприйняття. Та чи відповідають вони, а тим більше їх надмірне спрощення, реаліям суспільства Моди 2? Особливостям науки і освіти України сьогодні?

Всебічна оцінка стану науки логіки у близькій нам області простору-часу передбачає її огляд і аналіз з урахуванням усієї сукупності характерних ознак Моди 2. Але у першому наближенні припустимо обмежитись хоча б однією, найбільш суттєвою з них – контекстуалізацією. В такому зв'язку у вже згадуваній серії статей у "Філософських науках" знаходимо наступне.

"Вітчизняні підручники з логіки додержуються переважно академічної традиції. Західні (особливо американські) підручники з логіки, як правило, включають розлогі розділи, присвячені пошуку неформальних помилок (informal fallacies) у повсякденних міркуваннях. На численних прикладах у них розбираються навмисні й ненавмисні помилки та вади у міркуваннях… У вітчизняних підручниках розділ, присвячений аргументації, викладається істотно більш академічно, без численних апеляцій до конкретних прикладів", – констатують росіяни В. О. Бажанов и В. І. Маркін [Бажанов і Маркін 2013, 105]. Київська колега І. В. Хоменко визнає збереження ще з радянських часів основної установки при підготовці професійних кадрів, котра полягає у тому, щоб "дати студентам універсальні знання з логіки". Однак, вважає вона, ця установка не зовсім виправдовує себе за наших часів. Доцільнішою "виявляється не універсальна, а більш вузька спеціалізація, орієнтована на певну групу проблем" [Хоменко 2013, 115].

У наведених і подібних до них констатаціях відображена, по-перше, типова за умов Моди 1 спрямованість навчання на "процес прикладення" всезагальнонеобхідних логічних знань і, по-друге, незадовільність усього цього сьогодні. Такі твердження, супроводжувані здогадками про необхідність щільнішого обопільного зв'язку (розробки і викладання) логіки з різноманітними доменами людського буття, можуть, як на мене, знайти певне пояснення у прокламованій підходом Гіббонса – Новотни контекстуалізації науки.

Та в рамках підходу Гіббонса – Новотни контекстуалізація безпосередньо стосується *процесу виробництва* знань. А чи можна говорити про чутливість до контексту *результатів* цього процесу – змісту знань, що виробляються? Інакше кажучи, чи має сенс говорити про зміст науки логіки, який має не "апріорну" і всезагальну, а залежну від матерії міркувань і особливу природу? Важливе в такому зв'язку розділення *матеріальної* та *формальної логіки* знаходимо у вже згадуваних лекціях Гайдеггера 1928 року.

Будь-яке реальне мислення має свою тему, тому воно пов'язується з певним об'єктом, тобто з визначеним буттям, котре у кожному випадку знаходиться перед нами: певна фізична річ, геометричний об'єкт, історична подія, "лінгвістичний феномен". Ці об'єкти (речовинної природи, простору, історії) належать різним доменам... Мислене визначення, тобто формування концепту (concept formation), в різних доменах відбувається по-різному. Наукове дослідження мислення в кожному випадку виявляється відповідно різним: логіка мислення у фізиці, логіка математичного мислення, філологічного, історичного, теологічного і, зрештою, філософського мислення. Логіка цих дисциплін пов'язана з певним змістом. Це – *матеріальна логіка*, зауважив Гайдеггер. А далі додав, що мислення, узяте як мислення про щось, з довільним змістом, є формальним – у протилежність матеріальному, котре релевантне своєму змістові… Загальна логіка, як знання формального мислення, є *формальною логікою* [Heidegger 1984, 2-4].

Конкретизацію ідеї логіки, котра має силу в тому чи іншому особливому домені чи полі реальності, а тому виявляється особливо-матеріальною й, у цьому сенсі, чутливою до контексту, можна знайти в опублікованій у

1958 році книзі Стівена Тулміна "Використання аргументу". На його думку, міркування у тому чи іншому полі належить оцінювати на підставі прийнятих у ньому норм, і слід очікувати, що ці норми залежатимуть від поля їх прийняття. Достоїнства, яких вимагають від міркувань в одному полі, виявляється такими, що підлягають виключенню для цілком прийнятної аргументації в іншому [Toulmin 1958, 255]. Тому сукупність норм правильних міркувань суттєво залежить від конкретного поля, в якому розгортається пізнання чи комунікація, виробляються і утілюються рішення. Інакше кажучи, ці норми чутливі до контексту. Сказане не заперечує існування низки всезагальних логічних інваріантів, котрі мають деяке теоретичне і практичне значення. Проте самі по собі вони *не достатні* для аналізу чи побудови нетривіальних міркувань у тому чи іншому з особливих полів. Їх *доповнення* особливими матеріальними логіками тут не уникнути.

Висновки

Стан логіки в нашій країні дотепер відповідає ознакам Моди 1 за Гіббонсом – Новотни. Вона переважно орієнтована на ідеал довершено-всезагальної нормативності, припускаючи лише "процес застосування", тобто зовнішнього прикладення до нібито байдужого їй життя чи наукового пізнання. Однак логіка Моди 1, як і рідне їй суспільство Моди 1, по суті вже вичерпала свій потенціал. Це підтверджується падінням її освітнього статусу, котре лише підсилюється приєднанням національної системи освіти до Болонського процесу й низкою інших подібних чинників. Перспективи поступу і відновлення високого статусу логіки пов'язані з її адаптацією до "умов Моди 2", що передбачає, зокрема, чутливість до контексту. Але контекстуалізація має охоплювати не тільки процес виробництва знань, а й почасти їх зміст, а також логічну освіту.

Належна увага до особливих матеріальних логік – варіативного доповненням логіки загальної – дозволить суттєво розширити перспективи розвитку науки *логіки*. Орієнтація ж на соціальну добротність знань посприяє, серед іншого, піднесенню не тільки освітнього статусу *науки* логіки, а і позиції цілісної *науки логіки* в сучасному суспільстві.

Список використаних джерел:

1. Бажанов В. А. Логическое образование в России: краткая история, современное состояние, перспективы / В. А. Бажанов, В. И. Маркин // Философские науки. – №3 – М., 2013. – С. 98-109.

1. Кант И. Логика. Пособие к лекциям 1800 / И. Кант // Трактаты и письма. – М.: Наука, 1980. – С. 319-444.

2. Кант І. Критика чистого розуму / І. Кант : [Переклад І. Бурковського]. – Київ : Юніверс, 2000.

3. Тягло А. В. "Наука рассуждать" в "быстром мире" / А. В. Тягло // Философские науки. – №3 – М., 2013. – С. 129-136.

4. Тягло А. В. "Наука Моды 2?" / А. В. Тягло // Знання. Освіта. Освіченість. Збірник матеріалів III Міжнародної науково-практичної конференції, м. Вінниця, 28-29 серпня 2016 р. – Вінниця: ВНТУ, 2016. – С. 49-52.

5. Хоменко И. В. Преподавание логики на Украине: проблемы и перспективы / И. В. Хоменко // №3 – М., 2013. – С. 110-119.

6. Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., and Trow, M. (1994) The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Society. London: Sage Publication.

7. Heidegger, Martin (1984) The Metaphysical Foundations of Logic. Translated by M. Heim. Bloomington : Indiana University Press.

8. Nowotny, H., Scott, P., and Gibbons, M. (2001) Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty. Cambridge: Polity.

9. Nowotny, H., Scott, P., and Gibbons, M. (2003) ""Mode 2" Revisited: The New Production of Knowledge." Minerva 41: 179-194.

10. Nowotny, H., Scott, P., and Gibbons, M. (2006) "Re-Thinking Science: Mode 2 in Societal Context." In Collected Articles Knowledge Creation, Diffusion, and Use in Innovation Networks and Knowledge Clusters, 39-51. Westport : Praeger Publishers.

11. Toulmin, S. E. (1958) The Uses of Argument. Cambridge: Cambridge University Press.

References:

1. Bazhanov V. A. Logicheskoe obrazovanie v Rossii: kratkaja istorija, sovremennoe sostojanie, perspektivy / V. A. Bazhanov, V. I. Markin // Filosofskie nauki. – №3 – M., 2013. – S. 98-109.

1. Kant I. Logika. Posobie k lekcijam 1800 / I. Kant // Traktaty i pis'ma. – M.: Nauka, 1980. – S. 319-444.

2. Kant I. Kritika chistogo rozumu / I. Kant : [Pereklad I. Burkovs'ko-go]. – Kiïv : Junivers, 2000.

3. Tjaglo A. V. "Nauka rassuzhdat'" v "bystrom mire" / A. V. Tjaglo // Filosofskie nauki. – №3 – M., 2013. – S. 129-136.

4. Tjaglo A. V. "Nauka Mody 2?" / A. V. Tjaglo // Znannja. Osvita. Osvichenist'. Zbirnik materialiv III Mizhnarodnoï naukovo-praktichnoï konferencij, m. Vinnicja, 28-29 serpnja 2016 r. – Vinnicja: VNTU, 2016. – S. 49-52.

5. Homenko I. V. Prepodavanie logiki na Ukraine: problemy i perspektivy / I. V. Homenko // №3 – M., 2013. – S. 110-119.

6. Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., and Trow, M. (1994) The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Society. London: Sage Publication.

7. Heidegger, Martin (1984) The Metaphysical Foundations of Logic. Translated by M. Heim. Bloomington : Indiana University Press.

8. Nowotny, H., Scott, P., and Gibbons, M. (2001) Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty. Cambridge: Polity.

9. Nowotny, H., Scott, P., and Gibbons, M. (2003) ""Mode 2" Revisited: The New Production of Knowledge." Minerva 41: 179-194.

10. Nowotny, H., Scott, P., and Gibbons, M. (2006) "Re-Thinking Science: Mode 2 in Societal Context." In Collected Articles Knowledge Creation, Diffusion, and Use in Innovation Networks and Knowledge Clusters, 39-51. Westport : Praeger Publishers.

11. Toulmin, S. E. (1958) The Uses of Argument. Cambridge: Cambridge University Press.

Надійшла до редколегії 15.04.17

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НАУКА ЛОГИКИ МОДЫ 2?

Общее состояние и проблемы преподавания логики в университетах исследованы на основе подхода Гиббонса – Новотны. Эксплицировано основное содержание этого подхода и показано, что сейчас наука логики по существу отвечает "условиям Моды 1", тогда как перспективы ее развития связаны с адаптаций к "условиям Моды 2". Одним из моментов такой адаптации должна быть контекстуализация науки логики, касающаяся не только процесса производства знаний, но отчасти и их содержания и преподавания.

Ключевые слова: наука логики, наука Моды 2, общество Моды 2, общая логика, материальная логика.

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THE MODE 2 SCIENCE OF LOGIC?

Current status of logic and problems of its delivering in Russian and Ukrainian universities in terms of the Gibbons – Nowotny approach were studied. It is concluded that both the status and delivering process are relevant to the Mode 1 basic characteristics. Par excellence they are still oriented to the ideal of completed and universal system of norms of thinking which permits "process of application" only, i. e. external imposition to as if indifferent life or scientific cognition. But this Mode 1 logic as well as maternal Mode 1 society exhausted basic potential already. This fact is confirmed by degradation of its educational condition, and joining of the national educational systems to the Bologna process and a row of other factors support this failing only. Prospects of further advancement and renewal of high status of logic are connected with adaptation to the Mode 2 conditions which presupposes, inter alia, some "sensitivity to context". This "contextualization" must embrace not only process of knowledge production but content of logical knowledge and university logical education partially.

Proper attention to special material logics – varied addition to general logic – opens a new window of possibilities to science of logic. Orientation to social "robustness of knowledge" will make better both educational condition of discipline of logic and status of whole logic in up-to-date society.

Keywords: science of logic, discipline of logic, Mode 2 science, Mode 2 society, general logic, material logic.

НАУКОВІ ПОВІДОМЛЕННЯ / SCIENTIFIC NOTES

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UKRAINIAN NATIONAL IDENTITY BETWEEN EUROPEAN VALUES AND "HOMO SOVIETICUS" HYBRID IDENTITY: SYNERGY OF UNCERTAINTY AND STIPULATIONS

Abstracts of papers [1] presented at the conference "The Contemporary Relations between Russia, Ukraine and the European Union. Conference at Landstingssalen, The Danish Parliament, Christansborg, Friday the 23 of Januar, 2015" [2].

Dear sponsors and participants of the conference! First of all, let me express my most sincere condolences on the tragic events at the French magazine "Charlie Hebdo" office, and near Ukrainian town "Volnovakha", where the civilians were executed by the terrorist group.

These events have something in common, particularly the name: terrorism and violence. Although, they happened in geographically distanced countries of Europe: in France and Ukraine, they are bonded by the fact, that both of them have become the object of the terrorist threat. The international community shall do everything possible to prevent such acts of violence in any part of the world, where the human rights and their freedoms are of axiomatic civilization value.

Today, the question of Ukrainian identity is especially important, as all the events that have started the November 21st, 2013 and thereafter were named "Maidan", were mainly caused by the desire to protect the personal identity. The events in the country started from the Kyiv citizens' protests against the refusal of the Ukrainian government, guided by Mykola Azarov, to support the European Integration of Ukraine. However the "Maidan" society was formed very quickly, and finally it was supported by the whole Ukraine. One shouldn't take for granted the information that "Maidan" in Kyiv has gathered the representatives of only certain regions of Ukraine, as more or less, this movement has connected all citizens of Ukraine, who were joined by one aim – to get rid of the dominant influence of the criminal, imperial post-soviet system. The signing of the agreement with the EU was perceived as one of the major chances to better conditions of life turn.

There is no doubt that the first motifs of "Maidan" society formation were later supplemented by the other factors that quite literally started the formation of the new citizens of the new Ukraine, and led to the formation of the new qualities in the Ukrainian citizens identity, more than just certain ethnic and national features, as it was defined in USSR system. The process isn't simple; it is accompanied by the tragic events and is still not finished. The powerful regressive system does everything to prevent the normal evolutionary process of Ukrainian return into the European community. I would like to emphasize that it is not "joining", but "return", as Ukraine bears the impress of the difficult historical heritage of the enforced separation from the European grounds and the foreign culture influence during many centuries; first – of the Tsardom of Russia and then of the Russian Empire and USSR.

Ukrainian identity and Europe. Is there anything in common? The answer is clear: there is not only affinity, but also the genetic connection that for centuries haven't been torn, although it had no clear international importance. The narration of historical facts hardly fits our subject: the problems of the modern world that are directly related to the events in Ukraine of the 21st century. However, I have to mention some important events that are worth and need to be remembered.

Historical argument of the Ukrainian identity affinity with the European world and the European values.

Modern Ukraine has definite connection with the historical heritage of the Kievan Rus'. It is proved by thousands of scientific researches and historical facts. First mentions of the Kievan Rus' sovereignty appear in VI-VII centuries AD. The geopolitical value of Kievan Rus' was demonstrated not only by the quite successful occupation of other states and territories, but also by the considerable civilizational influence, that the Kievan Rus' had among the closer and distant lands, by the cultural and economic interchange within the medieval European community. Many of the European ruling dynasties looked toward to intermarry with the family of Grand Kyivan Knyazhs.

I would like to mention 2 facts. It is well known, that Yaroslav's daughter, Anne became a wife to Henry I of France. It determined her destiny as the ancestor of almost 30 kings of France, starting from the Capetian dynasty and then House of Valois. There is also quite probable historical statement that almost at the same time, in 1067, Anne of Kiev's (and later – queen of France) sister, Elisaveta Yaroslavna of Kiev became a wife to Sweyn II Estridsson, King of Denmark. In general, Yaroslav the Wise concluded 7 dynastic marriages for his children. It explains, why he was also called the matchmaker of the Europe. His son Iziaslav married Gertrude-Olisava, princess of Poland. Sviatoslav married the Austrian princess, Oda of Stade. Vsevolod married the Greek princess, and Yuri –the German princess. Elisaveta, who was mentioned above, first married the Norwegian king, Anastasia – the King of Hungary and Anne – the King of France.

These relations between Ukraine and European countries weren't stopped either in the XV-XVIII centuries. To prove it, it is sufficient to mention the names of Ivan Sirko, Bohdan Khmelnytsky, Ivan Mazepa and Philip Orlik with his first European Constitution of the Ukrainian state. The establishment of the equal international relations became possible after the power shift of 1917-18th in the Russian Empire. However, all these endeavors to restore full relations with the European world during 5 centuries at least, were accompanied by the factor of imperial engulf of the historical grounds of Kievan Rus' – Ukraine by the traditionally aggressive policy of Tsardom of Russia first, and then of the Russian Empire.

In fact, after the final destruction of the Ukrainian state in the XVIII century, the Russian Empire took unprecedented measures: it absorbed the historical memory of the Ukraine – Rus' national identity and turned it into its own local demonstration of the Russian state evolvement. It is more than century, that the researchers are arguing and proving, using the obvious facts, that the falsification of Ukraine-Rus' history in the Russian historiography was really dramatic, especially since the XVIII-XIX centuries. We can say that it was the first experience of Russia using historical (informational) means of war against Ukraine, as the tool for annexation and maintenance of

the authentic Ukrainian land, the people mind management ideological tool.

The practice of Ukrainian history falsification didn't change either in the official ideology of the Soviet Union, starting from the early 20s of the XX century. It is also subject to the process of so-called "voluntary" entry of Ukraine into the Soviet Union, the Holodomor, that lead to the millions of victims among the Ukrainians who were deliberately exterminated by creating conditions of starvation, and the constant battle with the Ukrainians, who questioned the restoration of the sovereignty and independence of Ukraine, as the full state of Europe.

The announcement of the sovereignty and independence of Ukraine in 1991, didn't put an end to the restoration of full Ukrainian state process, but was just a beginning of it. In this light, the events of Maidan in 2013-14 were only the important milestone in the recovery of the European status of Ukraine. However, this milestone was major and extremely important, as it demonstrated the birth of the modern Ukrainian European identity. The evolution of modern Ukraine over the last 23 years of independence certified the birth of the citizens with the new identity, Ukrainian European identity. This people were ready to put their own lives on the European values and the protection of essential human rights. What is really tragic, and what we can see now in Ukraine is in fact a war with the historical invader who strives in every way to prevent the return of Ukraine into the community of countries, where the roots of Ukraine-Rus' state with its capital in Kiev are historically lie.

Ukrainian identity in the modern conditions.

Today the question of philosophical definition of the term "identity" remains one of the most difficult. Right now it would be improper to do the theoretical insight into the history of the identity theory. However, one of the main research problems is the recognition of the identity either as the substantive essential basis of the person that is permanent in proving oneself, or as the dynamic temporal complex of person's impressions about itself.

It would be reasonable to uphold the position that first of all, the identity is a dynamic and variable form of human consciousness. Its meaning depends on many factors, including environment, education and nurturing, influences on the certain conclusions, and finally – the informational content of the mind.

In this connection, it is necessary to make the main conclusion – there is no dominant uniform identity in the modern Ukraine. However, it shows rather grand dynamic process of the modern Ukrainian identity formation, evoked by the events at the beginning of Maidan, than the lack of status of Ukrainian identity. The Maidan has finally indicated the birth of citizens, no longer identifying themselves with the Ukrainian Soviet history, who stepped forward to the way of self-determination, focused on the European values. Actually, it was specifically the radical attempt to cease identifying themselves with the Soviet imperial environment that created a mortal threat to the imperial Soviet, and later the modern Russian system, the successor of the USSR.

It is no surprise that the Maidan consciousness is the greatest threat to the integrity of the "Russian world", as it appeared as the conscious and, most of all, as the personal choice, that wasn't controlled from the outside. It destroys the philosophical foundations of the centenary existence of the empire, leaded and guided by the ideology of destruction, even the physical one, of the self-sufficient person.

As for the author, the main problem of the modern confrontations lies in the fact that the events in Ukraine have demonstrated *the possibility and the fact* of transformation of the "Soviet person" into the person, who has accepted what we call the European values and essential human rights as something evident, the meaning of life and existence. Denying them means losing life. This is probably one of the major changes in the definition of the current Ukrainian identity. And again, this modern Ukrainian identity is a mortal danger to the "Russian world" substance. The fact of the possibility of "Soviet man" or the "Russian world man" transformation into the personality can lead to the centenary history of the empire, guided by the violence ceasing to exist. Talking about violence, I mean the violence against the person's consciousness, which is sacrificed for the sake of substance of the state.

There is one comment on and the confirmation of the abovementioned message. If we look at the geography of the aggression outbreaks in the modern European values – oriented world, including Asian area, we can come to a conclusion that it clearly fits the historical geography of spread of the Russian, and moreover, of the Soviet imperial interests. Moreover, the tension, aggression, instability and terrorism grows at the areas, where the model of Soviet-Russian management was used at least for a short period. Unfortunately, such management was used almost all over the world. In the over-tense situation of the modern world, Ukraine is situated in the center of the premature detection of more than cosmological aspirations of the modern Russian government to dominate in the world and to prove, that its way of existence is the only possible, corresponding the laws of Genesis.

Why *premature*? There are more and more facts, testifying that the absorption of Ukraine as the independent sovereign state was planned in 2015 via manipulations with the constitutional basics of the state, and creation of the "hybrid" legislation for the possibility of sort of "voluntary" reconstruction of the status "1991", meaning the USSR. It is clear that the government of the former President of Ukraine was to provide the process. The Maidan erupted suddenly not only for the government of Ukraine and Russia, but also for most Ukrainians. But it suddenly has found the sufficient number of citizens who were ready for changes of the personal identity from the person of the recent historical period to the new one. This is precisely why the most cynic attempts to destroy the Maidan and the Maidan's consciousness indicate that this event gave rise to the possibility of demolition of the whole civilization of the "Russian world". Considering these factors we can determine the environment of formation and existence of the modern Ukrainian identity.

Typology of modern Ukrainian identity.

There is no doubt that the distinguished types listed below are not intended to be exhaustive. However they let us to navigate in the current situation.

1. Ukrainian identity marked by the affiliation to the citizenship of Ukraine – the national identity;

2. Within this type of identity the citizens of Ukraine with the modern Ukrainian identity can be distinguished, for whom the essential human rights, their protection and the European values became dominant;

3. Citizens of Ukraine who clearly recognize their affiliation to the citizenship of Ukraine, but who mostly identify themselves on the basis of "Ukrainian Soviet person" identity;

4. Citizens of Ukraine who recognize their affiliation to the citizenship of Ukraine but continue to identify themselves on the basis of "Soviet person" identity;

5. Citizens of Ukraine who involuntarily acknowledge their affiliation to the citizenship of Ukraine, and who identify themselves on the basis of "Soviet person" identity;

6. Citizens of Ukraine who involuntarily acknowledge their affiliation to the citizenship of Ukraine, who identify themselves on the basis of "Soviet person" identity and at the same time the "Russian World person" identity;

7. Citizens of Ukraine who deliberately ignore their affiliation to the citizenship of Ukraine, and who identify themselves on the basis of "Soviet person" identity and at the same time the "Russian World person" identity;

At the moment, there are no precise statistics on each type of identity, but the general national resistance against Russian aggression upon Ukraine confirms the predominance of Ukrainian citizens of the 1st-4th types. Types from 5th to 7th are the most problematic for the integrity and sovereignty of Ukraine. Today we can see the struggle of Russian Federation for the possibility to manipulate the citizens of Ukraine with these exact from 5th to 7th types of identity.

The aggressor's means of control over the identity of Ukrainian citizens.

Another thesis that should be mentioned at the conference is as follows: in the situation of a hybrid war we are dealing with the phenomenon of a "hybrid identity". Targeted efforts towards the formation of a hybrid identity violate the clear identification of the residents of Ukraine, primarily as the citizens of a sovereign, independent state, the subject of international law, that have all the powers and means to defend their lives and their state. The hybrid form of identity support by the Russian government also involves the transformation of consciousness, and its filling with the profitable content, or even the physical extermination in the strategic events of those who consciously discovered the properties of identity, focused on the priority of European values, and the recognition of the essential human rights. Today this exact group of citizens is standing at the vanguard of the Ukraine joining the European community.

Finally, we shall state, that together with the military demonstration of war, the main battle is the battle for the minds of people, of Ukrainian citizens, who will by their deeds determine the direction of Ukraine. It is also important that the said domination over the minds of people concerns not only the citizens of Ukraine, but most of all the citizens of Russia. As it was already mentioned before, the same conditions can be seen in the countries, where the Soviet-Russian governance model, the model of government and society relations was implemented even for a short period. As a result, in the minds of these countries' citizens, there are still the residuals of self-identification with the Soviet life environment and Soviet components of personal identity.

That's why the fight for the opportunity to restore the control over the content of consciousness as well as the reasons of the certain identity formation becomes the mean of expansion of Russian ideology, which is a prerequisite for the deployment of the next steps of the aggressive expansionist policy. All these components are illustrated in details in the situation in Ukraine. If the setting of control over the reasons for specific identity formation hadn't been done beforehand, the military phase of the expansion would have been impossible. Today we can see actual hostilities in those specific regions of the country, where the Russian influence managed to take control over the self-identification of Ukrainian citizens environment, moreover – to form the content of the citizens of another country identity, necessary for them. At the regions, where such attempts have been neutralized in time, we see tense situations, which are still can be described as situations of peaceful stability. Here, it is appropriate to mention Odessa, Kharkov, Mariupol, Zaporozhye, Dnipropetrovsk, and other Ukrainian cities.

Consequently, the following statement should be as follows: we shall regard the philosophical definition of the personal identity, as the dynamic, evolving phenomenon, that moreover can be influenced and manipulated. The present situation in Ukraine can be treated as the example for the analysis of the means of such control and management of the citizens' identity by the other country. Therefore, the maintenance of the "hybrid identity" status involves the creation of "manual control over the identity" tools.

"Manual control" over the identity.

There are two important comments, that will determine the brief analysis of the means of the human minds control, and hence its self-identification. I would like to emphasize once again, that for the modern "Russian world" the mortal threat lies not only in the appearance at the territory of Ukraine of the community of people with identity based on the European values, but also the possibility of this type of consciousness appearance at the territory of Russia itself. The paradoxical and dangerous fact is that the maintenance of Russia's Status quo forces it to persecute the post-Soviet manifestations of consciousness with a focus on European values and human rights at any territory that used to be at the USSR or Russia's zones of influence. For the religious leaders of Russia, it is crucial to demonstrate, that the evolution to the level of general civil democracy identity at the territory of the "Russian world" interests is fundamentally impossible, and shall those, who decide to get rid of the Soviet mind features be stigmatized as people, going the wrong way. Otherwise, the age-old substance of the "Russian world" will rapidly and irreversibly collapse by the "domino effect". Thence, the minimum task for the modern Russian government is to increase the range of other countries' citizens who continue to identify themselves according to 4-5 types.

One of the major tools of the "hybrid identity" support that blurs the clear contours of the national identity of Ukrainian citizens is the massive use of the modern media that have long ago gone beyond the limits of promulgation of the true facts about the events and phenomena. As a mean of the "manual control over the identity", the media are used to create the necessary material, which directly affects the reasons of human identification, and finally, the establishment of its identity.

In addition to the media, it is important to mention the following factors that stimulated and are still influencing the identification processes in Ukraine:

1. The annexation of Ukraine and its return to the "Russian World" zone of influence was planned long before the "Maidan" events of 2013-14's. It can be proved by the facts from the own experience of Ukraine studies researches and by the public events that started immediately after President Yanukovych coming to power. Working on the electronic edition of the scientific journal "Ukrainian studies", starting from the 2009, the editorial staff drew attention to the increased interest in Russian search systems, that were extremely active in copying all the materials that were published on the site; in December 2009, the search system spider2.mail.ru immediately copied 15 771 pages, in March 2010 – 10 360 pages, in June 2010 – 17 452 etc. Hence we can say that it was that time, when the Russian analysts were performing potent analysis of the theoretical developments in the field of "Ukrainian studies", particularly, of the Ukrainian identity.

2. The practice of the "historical reconstructions" became significantly widespread over the territory of Ukraine, the events in terms of these reconstructions were presented from the certain ideological perspective and it was the exact time, when the ideas about "fascists, anti-Semites and Nazis" in Ukraine were imposed over

the society and the international community. Many representatives of the European Community, in particular, took the position for granted.

3. In addition to the content of identities manipulations in Ukraine, we should mention one of the theoretical bases of the modern expansion policy of Russian influence that is the theory of synergy that was actively developing in Russia for more than 10 years. Unfortunately, this theoretical platform is used with the negative purpose, as the synergy of facts of terror, which are to ensure the spread of the Russian interests as far, as it is possible. Thus, the military actions at the sovereign territory of Ukraine, the acts of terror in France, in Armenia and in other countries, create the synergy of violence and tension; they become the means for geopolitical goals achievement.

In conclusion, I would like to mention the following. Today, the researches on the Ukrainian identity are very important. They can demonstrate how the goals can be achieved in other countries of the European Union. The similar manipulations with the attempts to "control the identities manually" were notices in the Baltic States, in Poland, Hungary, Slovakia, etc. The negative synergy of these events can cause the catastrophic consequences for the European and international community.

I would like to mention, that the Ukrainian events became the unexpected impact for the rethinking of the role and importance for the international community of freedom, democracy, human rights and European values. The protection of these values by the modern Ukraine is provided by the lives of Ukrainians, the citizens of Ukraine, regardless of origin, religion, sex or the ideological viewpoints. Thereby, the Ukraine applies with request to the world to understand that freedom and democracy are in need of protection and decisive actions; it is not merely the internal problem of Ukraine, Russia and the European Union. Thanks to the events in Ukraine, freedom, democracy and the values created at the territory of Europe became global and have created the new world paradigm. Freedom and democracy become the meaning of existence of the new global system, of the new world order. I am sure that struggle for these values will lead to the peace and prosperity of the people of free will.

Once again, I would like to express my sincere gratitude to the sponsors of the conference for the opportunity to inform the European community about the important problems of the modern Ukraine, and for the possibility to discuss the outstanding values of freedom, human rights and democracy.

References:

1. Af Karsten Fledelius Rusland, Ukraine og Den europæiske Union! // MENNESKERET & VRANG. – 2015. – № 2. – P. 14-16. [Electronic resource] / Af Karsten Fledelius. – Access mode: http://helsinkicommittee.dk/wp-content/uploads/2015/06/MenneskeRet-Vrang-Nr-2_2015_WEB.pdf

2. The Contemporary Relations between Russia, Ukraine, and the European Union. Conference at Landstingssalen, Christiansborg (The Danish Parliament) // [Electronic resource] – Access mode: http://humanities.ku.dk/calendar/2015/january/russia_ukraine_europe/

Received Editorial Board 12.04.17

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THE APPLICATION OF E-LEARNING METHODS IN THE TEACHING OF LOGICAL AND PHILOSOPHICAL DISCIPLINES

In the conditions of dynamic development of the labor market, firstly, the level of qualification is growing, it becomes necessary to change the specialty. Secondly, during the last decades an intensive modernization of information technologies in the system of distance education has been observed. The development of technologies directs the entire education system (especially the higher education system) to the transition to a new stage, where the online education system is gaining wide popularity and relevance. Finally, the more structured online education, the more effective it becomes. At the same time, limited time in the classroom is not an obstacle to the formation of the proper competence of a person as a specialist.

Undoubtedly, online education is not only a way of obtaining a diploma, but also an opportunity to get knowledge and skills on the job, to be hardworking and self-organized, to be highly skilled and in demand in the future.

In recent years, online lectures have gained popularity in universities around the world. More and more universities started talking about the prospects of blended education, which means that the best courses of teachers become the basis for learning, and the achievements of students in online education are transferred to a diploma. Such measures can unite all the best in academic education and bring it to a new quality level where teachers can compete with the best specialists and universities in the world. Thus, the Internet not only makes learning accessible to people, but also completely changes the very approach to the learning process.

Creation of educational platforms has allowed to receive high-quality online education and to determine the purpose of education, knowledge and skills that a person wants to get, choosing for themselves the best educational platforms. Among modern online platforms, "Coursera" is considered one of the most popular educational platforms in the world. It has more than 15000000 users. "Coursera" courses are available in online format and are most approximate to the requirements of academic education. Such courses, in their structure and content, resemble similar courses at universities. In general, Coursera is an attempt to make online university education more accessible.

In 2013, the Massachusetts Institute of Technology created an open platform for free edX courses, later joined by Harvard University, as well as over 90 US and international partners. Now edX is a nonprofit site with over 800 free online courses. Thus, edX and Coursera absorbed the academic courses of universities and the resources of large corporations in different areas of education.

In general, the challenges and demands of the sociocultural environment and the economy, on the one hand, and the growing desire of people to get knowledge in various specialties without leaving home, to gain access to online courses, on the other hand, have formed the needs of modernizing the information and technological foundations of the functioning of higher education system. And therefore, in many countries of Europe and the world, online education has begun to gain key positions at various levels of the educational process.

As for Ukraine, then online education has become one of the innovations that have appeared almost simultaneously with the same Western initiatives. Starting from 2013, online education has confidently begun to enter the Ukrainian educational space. To realize the needs for obtaining virtual education in Ukraine, the first Prometeus project was introduced. He gave an opportunity on the basis of Open edX to launch online courses. I. Primachenko, a post-graduate student of Taras Shevchenko National University of Kyiv, and A. Molchanovsky, professor of the KPI, created this program. Without any financial support, this project for the year was able to collect more than 150,000 users and offer more than 30 courses.

Let's note that Prometeus is a combination of large academic courses of world universities and universities of Ukraine, which allows receiving a certificate at the end of the course. However, the main achievement of the organizers of Prometeus is the attraction of Ukrainian universities to cooperation with the support of the world's leading universities. In fact, the organizers of this platform are convinced that the combination of the best qualities of online and offline education provides an effective opportunity:

- Attracting qualified teachers;
- Quickly create and disseminate the most up-to-date training programs;
- Allows students to receive individual consultations and conduct a final exam.

Continued this tradition of online education Ukrainian platform EdEra in 2014. In this program, the following elements were successfully connected: interactive lectures, abstracts, books, homework, exams, the opportunity to communicate with teachers. Another EDUGET project appeared in 2015. With the participation of two Ukrainian investors who drew attention to the fact that online education can be of high quality and promising for business in Ukraine. In this program, you can find lectures on various subjects from teachers and practitioners. And all this shows that the professionally-oriented approach is designed to help users constantly update their practical knowledge and remain in demand on the labor market.

A vivid example of effective work of electronic education in the Ukrainian higher education system – at the Philosophy Faculty of Taras Shevchenko National University of Kyiv was developed a course of video lectures on philosophy for humanitarian specialties (Certificate of Copyright №6128 of August 14, 2015) and a course of video lectures on philosophy for Natural specialties (copyright certificate №6129 of August 14, 2015). These courses of professors were placed on the Internet portal of e-learning of post-graduate students Taras Shevchenko National University of Kyiv, created by researchers of the Philosophical Faculty[1].

Typical problems of teaching logical and philosophical disciplines in the system of higher education of Ukraine are:

– Limited time for training courses aimed at forming general and special / professional competencies;

– Large number of lecturers (80-150 students) and groups of practical classes (25-30 students);

– Low productivity of students' work at lectures;

– Overload of teacher and student with accompanying paper documentation, because this work is carried out during educational time;

– Student communication with a teacher only in oral form.

In our opinion, the use of e-learning is a productive tool for solving the problems described above. The Moodle open source software (Modular Object-Oriented Dynamic Learning Environment) can be of high efficiency.

The main goal of creating and implementing the e-learning system of the Philosophical Faculty is to increase the scientific and methodological level of the organization of the educational process, improve the quality and effectiveness of education, and harmonize the domestic education with the international educational space.

Based on our experience of practical application of Moodle software product during 2014 – 2016 in the process of teaching philosophical and cultural disciplines for postgraduate students and students of Taras Shevchenko National University of Kyiv of Humanities and Natural Sciences, the following positive e-learning opportunities can be formulated:

– Increased productivity of lecture lessons by preplacing the materials of the lecture on the course page;

– Authorized and supervised by teacher access to the contents of the training course, the creation of personal accounts by the method of self-registration;

– Control of the academic activity of each student;

– Conducting online test tasks with the given time, number of attempts and method of evaluation, automated evaluation system;

– Automatic formation of lists of students, academic groups, assessment magazines;

– Improvement of the conditions of independent work of the student by placing electronic links and electronic versions of the recommended academic and scientific literature;

– Activating communication between students and the teacher in the form of creating electronic forums, sending personal and group messages, commenting on the tasks performed;

– Improving the internal quality assurance system. Educational materials and all information on student learning are stored on the server unlimited, and an array of statistical information is created for further analysis.

The most effective and expedient way is to use e-learning as an auxiliary tool.

In 2016, the web-portal "E-Learning System of the Philosophical Faculty" was created at the Philosophical Faculty of the Taras Shevchenko National University of Kyiv (www.e-philosophy.kiev.ua)[2].

In recent years, 17 training courses have been implemented within the framework of the e-learning system of the Philosophical Faculty:

Philosophical problems of modern logic, specialty "Philosophy", lecturer *Iryna Khomenko*

Heresy, specialty "Philosophy", lecturer *Iryna Khomenko*

Rhetoric, specialty "Religious Studies", lecturer *Natalia Kolotilova*

Modern logic, specialty "Philosophy", lecturer *Natalia Kolotilova*

Modern logic, specialty "Religious studies", lecturer *Natalia Kolotilova*

Traditional logic, specialty "Religious studies", lecturer *Natalia Kolotilova*

Contemporary logic, specialty "Philosophy", lecturer *Iryna Khomenko*

Philosophy of culture, lecturer *Volodymyr Prikhodko*

History of science and technology, lecturer *Lyudmila Shashkova*

[1] Internet portal for postgraduate distance education: [Electronic resource]. – Access mode: www.phdprogramme.univ.kiev.ua:8080.

[2] E-Learning System of the Philosophical Faculty of Taras Shevchenko National University of Kyiv: [Electronic resource] .- Mode of access: www.e-philosophy.kiev.ua

Introduction to the specialty, lecturer *Sergii Rudenko*

Methodology of teaching cultural studies at a high school, lecturer *Sergii Rudenko*

History of Ukrainian Philosophy, lecturer *Sergii Rudenko*

American Philosophy, lecturer *Yaroslav Sobolevsky*

Cosmology in the history of European philosophy, lecturer *Yaroslav Sobolevsky*

History of Ancient Philosophy (part I), lecturer *Anna Bokal*

History of Philosophy for Political Scientists (Part I), lecturer *Tetyana Trush*

Draft standard for the use of e-learning in the teaching of philosophical and political science disciplines.

An electronic learning system is used as an auxiliary tool.

For each discipline and teacher, a separate page is created

Access to the course's electronic page is given to students exclusively for the period of theoretical training, which is determined by the curriculum of the educational process.

For the first access to the electronic page of the discipline, each student must complete the self-registration procedure on the page of the system of electronic learning of the Philosophical Faculty by providing the necessary information.

Electronic discipline page contains the following components:

– Information about the lecturer (including contacts)

– Educational discipline program;

– Materials for preparation for lectures;

– Auxiliary training material (electronic versions of textbooks, tutorials, presentations, etc.).

Methods of conducting lectures

Lecture classes are conducted in the form of an expanded commentary on the disposition placed on the electronic page. Theoretical materials, modern textbooks, study aids, scientific monographs, scientific articles, other scientific information are commented.

An important condition for the effectiveness of lecture classes is the students' prior acquaintance with the materials of the lecture. After getting acquainted, students attend a lecture.

Methodology for conducting seminars

Seminars are held in the form of presentations by students of the tasks performed and their discussion in the academic group (groups).

The main work of the seminars is to prepare electronic presentations devoted to answer one of the questions of seminars / individual work of students oral report in the form of comments to the prepared electronically presentations, informative addition to presentations and reports made to elaborate on seminar occupation.

The presentation is a text or graphic or visual material prepared by the student, which reflects the answer to one of the questions for the seminar session.

Students must send an electronic presentation on the content of one of the seminar questions no later than 15-00 a working day preceding the scheduled time of the seminar session, on a specially created e-mail of the teacher who holds a seminar session.

A lecturer, who conducts seminars, creates organizational conditions for the students to process all the questions that have been made at the seminar session.

Presentations that have been submitted with a maturity date are not evaluated. The student's log book displays the "0" mark.

In the absence of a student at a seminar session without valid reasons, the presentation submitted to him is not evaluated. The student's log book is marked "A", which means "Missing".

In the case of academic plagiarism, the presentation submitted by the student is not evaluated. The student's log book displays the "0" mark.

Received Editorial Board 15.04.17

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Наукове видання

ВІСНИК

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ФІЛОСОФІЯ

Випуск 2(2)

Оригінал-макет виготовлено Видавничо-поліграфічним центром "Київський університет"

Формат 60x84$^{1/8}$. Ум. друк. арк. 4,4. Наклад 300. Зам. № 214-7100.
Гарнітура Arial. Папір офсетний. Друк офсетний. Вид. № Фл2.
Підписано до друку 03.07.17

Видавець і виготовлювач
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Свідоцтво суб'єкта видавничої справи ДК № 1103 від 31.10.02