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APPLYING LOGIC TO PHILOSOPHICAL THEOLOGY: A FORMAL DEDUCTIVE INFERENCE OF AFFIRMING GOD'S EXISTENCE FROM ASSUMING THE A-PRIORI-NESS OF KNOWLEDGE IN THE SIGMA FORMAL AXIOMATIC THEORY

For the first time a precise definition is given to the Sigma formal axiomatic theory, which is a result of logical formalization of philosophical epistemology; and an interpretation of this formal theory is offered. Also, for the first time, a formal deductive proof is constructed in Sigma for a formula, which represents (in the offered interpretation) the statement of God's Existence under the condition that knowledge is a priori.
Keywords: *formal axiomatic epistemology theory; two-valued algebra of formal axiology; formal-axiological equivalence; a-priori knowledge; existence of God.*

1. Introduction

Since Socrates, Plato, Aristotle, Stoics, Cicero, and especially since the very beginning of Christianity philosophy, the possibility or impossibility of logical proving God's existence has been a nontrivial problem of philosophical theology. Today the literature on this topic is immense. However, even in our days, the knotty problem remains unsolved as all the suggested options of solving it are controversial from some point of view.

Some respectable researchers (let us call them "pessimists") believed that the *logical proving* of God's existence in theoretical philosophy was impossible on principle, for instance, Occam, Hume [1], and Kant [2] believed that any *rational theoretic-philosophy proof* of His existence was a mistake (illusion), consequently, a search for the *logical proving* of His existence was wasting resources and, hence, harmful; only *faith* in God was relevant and useful; reason was irrelevant and useless. At the very beginning of the 21st century, a theoretically interesting discourse of impossibility to demonstrate logically the existence of a Deity was developed at the level of contemporary symbolic logic and set theory by Bocharov and Yuraski-

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Название статьи: Приложение логики к философской теологии: формальный дедуктивный вывод утверждения о бытии Бога из допущения априорности знания в формальной аксиоматической теории Сигма.

Аннотация. Впервые дается точное определение формальной аксиоматической теории Сигма, являющейся результатом логической формализации философской эпистемологии, и предлагается интерпретация этой формальной теории. Также впервые в теории Сигма конструируется формальное дедуктивное доказательство такой формулы, которая, при условии принятия допущения об априорности знания, представляет собой (в указанной интерпретации) утверждение о бытии Бога.

Ключевые слова: формальная аксиоматическая теория эпистемологии; двузначная алгебра формальной аксиологии; формально-аксиологическая эквивалентность; априорное знание; бытие Бога.

na [3]. Their attitude to the faith-reason-problem was an *inverted* and modernized one of Tertullian [4]. Their attitude was an *inverted* one (*in relation to* Tertullian) because they rejected resolutely his maxim "*Credo quia absurdum est*", but, being his worldview-opponents in relation to Faith, they agreed with Tertullian's statement that Reason and Faith were absolutely separated. As to the possibility of logical proving God's existence, Bocharov and Yuraskina were pessimists owing to their belief in the possibility of logical proving the impossibility of God's existence. In this concrete relation, Bocharov and Yuraskina, who have manifestly called themselves "convinced atheists" [3. P. 3], belong to the pessimists who think (together with Tertullian) that faith and reason are absolutely incompatible. According to some non-atheist-minded but *sincerely religious* representatives of the pessimists, looking for a perfect proof of God's existence is exposing the nonexistence of faith in His existence, i.e. exposing atheism.

However, some other eminent thinkers (let us call them "optimists") believed that, on principle, the *logical proving* statement of God's existence *within rational theoretic philosophy* was possible and compatible with faith, namely: St. Anselm [5]; St. Thomas Aquinas [6–8]; Descartes [9–11]; Spinoza [12]; Leibniz [13, 14]; Gödel [15, 16]; Plantinga [17]; consequently, a search for the logical proving of His existence could be successful and useful; therefore, expending some limited resources for the search was worth undertaking. Equipped with the concrete logic tools available at their time, optimists attempted to invent (construct) a perfect logical proof of God's existence within some rational philosophical theology doctrine and thus to establish a perfect harmony of faith and reason. Before the 20th century, all the attempts were accomplished by means of natural language and traditional (not-mathematized) classical formal logic. In the 20th century, Gödel [15] made an original attempt to apply *artificial language* and *modern symbolic logic* machinery for creating a *formal deductive proof* of God's existence. This formal deductive proof initiated an interesting discussion [17]. Plantinga's applying modal logic to the problem is also worth mentioning here. A noteworthy critical analysis of Plantinga's modalizing the ontological argument is made in Gorbatova's publications and in her interesting dissertation [18]. A systematical critique of all the hitherto invented ontological arguments is given by Lewis [19] and Sobel [20]. A respectable survey of the theoretically significant literature on the theme is done by Oppy [21].

With respect to both sides: the pessimists and the optimists, in the present article I would like to take part in discussing the nontrivial problem. Below I will be writing within the paradigm of the optimists. However, in this article, the optimistic paradigm has undergone a significant modification, as the conceptual apparatus exploited for the deductive logical proving of God's existence differs much from the one used by the overwhelming majority of the optimists hitherto. I mean systematical exploiting (1) two-valued algebra of formal axiology [22–24] and (2) a formal axiomatic epistemology theory **Σ** (Sigma) to be precisely defined for the first time below in the article. Hereafter the terms "proof" and "theorem" are used in the special meanings which have been defined in the 20th-century mathematical logic by the formalists (D. Hilbert et al). Gödel's famous proof of God's existence is a representative example of the systematical usage of the terms "proof" and "theorem" in the indicated formalistic meanings. In the present article, I shall use these terms in the formalistic meanings as well. Namely, by definition, a proof of a formula as a theorem in an axiomatic theory is such a finite succession of formulae of the theory, in which (succession) any formula belonging to the succession is (1) either an axiom of the theory or (2) obtained from previous formulae of the succession by an inference-rule of the theory.

Within the hitherto not considered formal axiomatic theory **Σ**, below a *formal deductive proof of formula (Aα ⊃ [Dx]) as a theorem in* **Σ** is constructed for the first time. The article gives such an interpretation of the formal axiomatic epistemology theory **Σ**, in which the formula [Dx] of **Σ** represents the famous theology *tenet of God existence*. According to the given interpretation, the formula Aα represents the *assumption of a-priori-ness of knowledge*. In the interpretation under discussion, "⊃" is "classical (material) implication". Formally to prove that (Aα ⊃ [Dx]) is a theorem in **Σ** and to attentively examine the proof, it is indispensable to have exact definitions of the terms involved into the discourse. Therefore, let us start with submitting precise definitions of the notions relevant to the case.

2. A Precise Definition of the Formal Axiomatic Epistemology Theory Σ

Section 2 of this article is aimed at acquainting the reader with the rigorous formulation of the formal axiomatic epistemology theory **Σ**, which is a result of a further development (complementing substantially) the axiomatic epistemology system Ξ originally submitted in [25, 26].

According to the definition, the logically formalized axiomatic epistemology system **Σ** contains all symbols (of the alphabet), expressions, formulae, axioms, and inference-rules of the formal axiomatic epistemology theory Ξ [25; 26] which is based on the classical propositional logic. But in **Σ** several significant aspects are added to the formal theory Ξ.

As a result of these additions, the alphabet of **Σ**'s object-language is defined as follows:

1) propositional letters q, p, d, … are symbols belonging to the alphabet of **Σ**;

2) logic symbols ¬, ⊃, ↔, &, ∨ called "classical negation", "material implication", "equivalence", "conjunction", "not-excluding disjunction", respectively, are symbols belonging to **Σ**'s alphabet;

3) technical symbols "(" and ")" belong to **Σ**'s alphabet;

4) *axiological variables* x, y, z, … are symbols belonging to **Σ**'s alphabet;

5) symbols "g" and "b" called *axiological constants* belong to the alphabet of **Σ**;

6) *axiological-value-functional symbols* A_k^n, B_i^n, C_i^n, D_m^n, J, N, D, I, L, … belong to the alphabet of **Σ**. The upper number index *n* informs that the indexed symbol is *n*-placed one. Nonbeing of the upper number index informs that the symbol is determined by one axiological variable. The value-functional symbols may have no lower number index. If lower number indexes are different, then the indexed functional symbols are different ones.

7) symbols "[" and "]"belong to the alphabet of **Σ**;

8) an unusual artificial symbol "=+=" called "*formal-axiological equivalence*" belongs to the alphabet of **Σ**;

9) a symbol belongs to the alphabet of object-language of **Σ**, if and only if this is so owing to the above-given items 1) – 7) of the present definition.

A finite succession of symbols is called an *expression* in the object-language of **Σ**, if and only if this succession contains such and only such symbols which belong to the above-defined alphabet of **Σ**'s object-language.

Now let us define precisely the general notion "*term* of **Σ**":

1) the *axiological variables* x, y, z, … (from the above-defined alphabet) are terms of **Σ**;

2) the *axiological constants* "g" and "b", belonging to the alphabet of **Σ**, are terms of **Σ**;

3) If F_k^n is an *n-placed axiological-value-functional symbol*, and t_i, … t_n are *terms* (of **Σ**), then $F_k^n t_i$, … t_n is a term (compound one) of **Σ** (here it is worth remarking that symbols t_i, … t_n belong to the meta-language, as they stand for *any* term of **Σ**; the analogous remark may be made in relation to the symbol F_k^n);

4) An expression in language of **Σ** is a term of **Σ**, if and only if this is so owing to the above-given items 1) – 3) of the present definition.

Now let us agree that in the present article symbols α, β, ω, π, … (belonging to meta-language) stand for *any* formulae of **Σ**. By means of this agreement the general notion "*formulae* of **Σ**" is defined precisely as follows.

1) All the above-mentioned propositional letters q, p, d, … are formulae of **Σ**.

2) If α and β are formulae of **Σ**, then all such expressions of the object-language of **Σ**, which possess logic forms $\neg\alpha$, $(\alpha \supset \beta)$, $(\alpha \leftrightarrow \beta)$, $(\alpha \,\&\, \beta)$, $(\alpha \vee \beta)$, are formulae of **Σ** as well.

3) If t_i and t_k are terms of **Σ**, then $(t_i{=}{+}{=}t_k)$ is a formula of **Σ**.

4) If t_i is a term of **Σ**, then $[t_i]$is a formula of **Σ**.

5) If α is a formula of **Σ**, then $\Psi\alpha$ is a formula of **Σ** as well.

6) Successions of symbols (belonging to the alphabet of the object-language of **Σ**) are formulae of **Σ**, if and only if this is so owing to the above-given items 1) – 5) of the present definition.

The symbol Ψ belonging to meta-language stands for any element of the set of modalities {$\Box$, K, A, E, S, T, F, P, Z, G, W, O, B, U, Y}. Symbol $\Box$ stands for the alethic modality "necessary". Symbols K, A, E, S, T, P, Z, respectively, stand for modalities "agent *knows* that…", "agent *a-priori knows* that…", "agent *a-posteriori knows* that…", "under some conditions in some space-and-time a person (immediately or by means of some tools) *sensually perceives* (has *sensual verification*) that…", "it is *true* that…", "person *believes* that…", "it is *provable* that…", "there is *an algorithm* (a machine could be constructed) *for deciding* that…".

Symbols G, W, O, B, U, Y, respectively, stand for modalities "it is *(morally) good* that…", "it is *(morally) wicked* that…", "it is *obligatory* that …", "it is *beautiful* that …", "it is *useful* that …", "it is *pleasant* that …". Meanings of the mentioned symbols are defined by the following schemes of own-axioms of epistemology system **Σ** which axioms are added to the axioms of classical propositional logic. Schemes of axioms and inference-rules of the classical propositional logic are applicable to all formulae of **Σ**.

Axiom scheme AX-1: $A\alpha \supset (\Box\beta \supset \beta)$.

Axiom scheme AX-2: $A\alpha \supset (\Box(\alpha \supset \beta) \supset (\Box\alpha \supset \Box\beta))$.

Axiom scheme AX-3: $A\alpha \leftrightarrow (K\alpha \,\&\, (\Box\alpha \,\&\, \Box\neg S\alpha \,\&\, \Box(\beta \leftrightarrow \Omega\beta)))$.

Axiom scheme AX-4: $E\alpha \leftrightarrow (K\alpha \,\&\, (\neg\Box\alpha \vee \neg\Box\neg S\alpha \vee \neg\Box(\beta \leftrightarrow \Omega\beta)))$.

Axiom scheme AX-5:$(\Box\beta \,\&\, \Box\Omega\beta) \supset \beta$.
Axiom scheme AX-6: $(t_i{=}{+}{=}t_k) \leftrightarrow (G[t_i] \leftrightarrow G[t_k])$.
Axiom scheme AX-7: $(t_i{=}{+}{=}g) \supset G[t_i]$.
Axiom scheme AX-8: $(t_i{=}{+}{=}b) \supset W[t_i]$.
Axiom scheme AX-9: $G\alpha \supset \neg W\alpha)$.
Axiom scheme AX-10: $(W\alpha \supset \neg G\alpha)$.

In AX-3 and AX-4, the symbol Ω (belonging to the meta-language) stands for any element of the set $\Re = \{\Box, K, T, F, P, Z, G, O, B, U, Y\}$. Let elements of $\Re$ be called "*perfection*-modalities" or simply "perfections".

The axiom-schemes AX-9 and AX-10 are not new in evaluation logic: one can find them in Ivin's famous monograph [27]. But axiom-schemes AX-5–AX-8 are perfectly new: they have not been published hitherto.

3. Defining Semantics of/for Σ

Meanings of the symbols belonging to the alphabet of the object-language of **Σ** owing to items 1–3 of the above-given definition of the alphabet are defined by classical propositional logic.

Axiological variables x, y, z, … range over (take their values from) such a set Δ, every element of which has: (1) one and only one *axiological value* from the set {good, bad}; (2) one and only one *ontological value* from the set {exists, not-exists}.

Axiological constants "g" and "b" mean, respectively, "good" and "bad".

N-placed terms of **Σ** are interpreted as n-ary algebraic operations (n-placed evaluation-functions) defined on the set Δ.

Speaking of *evaluation-functions* means speaking of the following mappings (in the proper mathematical meaning of the word "mapping"): $\{g, b\} \rightarrow \{g, b\}$, if one speaks of the evaluation-functions determined by *one* evaluation-variable; $\{g, b\} \times \{g, b\} \rightarrow \{g, b\}$, where "×" stands for the Cartesian product of sets, if one speaks of the evaluation-functions determined by *two* evaluation-variables; $\{g, b\}^N \rightarrow \{g, b\}$, if one speaks of the evaluation-functions determined by *N* evaluation-variables, where *N* is a finite positive integer.

If t_i is a term of **Σ**, then formula $[t_i]$ of **Σ** means *either true or false proposition* "ti exists". The proposition [ti] is true if and only if ti has the ontological value "exists".

The formula $(t_i{=}+{=}t_k)$ of **Σ** is translated into natural language by the proposition "t_i is *formally-axiologically equivalent* to t_k", whose proposition is true if and only if the terms t_i and t_k have identical *axiological values* from the set {good, bad} under any possible combination of *axiological values* of their *axiological variables.*

The one-placed term *Dx* is interpreted in this article as *one-placed evaluation-function "God of* (what, whom) *x in a monotheistic world-religion"*. This function is precisely defined by the following evaluation-table 1.

Table 1. **One-placed evaluation-functions**

x	Jx	Nx	Dx	Ix	Lx	Ax
g	g	b	g	g	b	b
b	b	g	g	b	g	b

In the above evaluation-table 1, the symbol *Jx* stands for the evaluation-function "*being (existence), life of* (what, whom) *x*". *Nx* stands for the evaluation-function "*non-being (nonexistence), death of* (what, whom) *x*". *Dx* stands for the evaluation-function “*God of* (what, whom) *x in monotheistic world-religion”*. *Ix* stands for the evaluation-function “*deity of* (what, whom) *x in polytheistic local (pagan, heathen) religion*”. *Lx* means the evaluation-function “*daemon of x in polytheistic local (pagan, heathen) religion”*. *Ax* – “*Anti-God (God’s Enemy) of* (what, whom) *x in monotheistic world religion*”.

4. Formal Proving ($A\alpha \supset [Dx]$) in Σ

The proof of ($A\alpha \supset [Dx]$) in $\mathbf{\Sigma}$ is the following succession of formulae.

1) $(Dx= + =g) \supset G[Dx]$ by substituting Dx for t_i in axiom-scheme AX-7.

2) $(Dx= + =g)$ by the formal-axiological definition of God as *absolute goodness*.

3) $G[Dx]$ from 1 and 2 by *modus ponens*.

4) $A\alpha \leftrightarrow (K\alpha \,\&\, (\Box\alpha \,\&\, \Box\neg S\alpha \,\&\, \Box([Dx] \leftrightarrow G[Dx])))$ by: substituting G for Ω; and substituting [Dx] for β in AX-3.

5) $A\alpha \supset (K\alpha \,\&\, (\Box\alpha \,\&\, \Box\neg S\alpha \,\&\, \Box([Dx] \leftrightarrow G[Dx])))$ from 4 by the rule of elimination of $\leftrightarrow$.

6) $A\alpha$ assumption.

7) $K\alpha \,\&\, (\Box\alpha \,\&\, \Box\neg S\alpha \,\&\, \Box([Dx] \leftrightarrow G[Dx]))$ from 5 and 6 by *modus ponens*.

8) $\Box([Dx] \leftrightarrow G[Dx])$ from 7 by the rule of elimination of &.

9) $[Dx] \leftrightarrow G[Dx]$ from 8 by the rule of elimination of $\Box$.

10) $G[Dx] \supset [Dx]$ from 9 by the rule of elimination of $\leftrightarrow$.

11) $[Dx]$ from 3 and 10 by *modus ponens*.

12) $A\alpha \mid\!\!— [Dx]$ by the above formula-succession 1—11.

13) $\mid\!\!— (A\alpha \supset [Dx])$ from 12 by the rule of introduction of $\supset$.

Here you are.

5. Discussing the Theorem and Arriving to the Conclusion

Hume [1. P. 372–378] undertook a systematical critique of all possible *a priori* arguments demonstrating rational-philosophy statement of the existence of a Deity. In relation to his negating the *a priori* arguments *in general*, the result obtained above in the present article is a counter-example; at least some of the *a priori* arguments can be valid. In the above-defined interpretation of $\mathbf{\Sigma}$, the theorem ($A\alpha \supset [Dx]$) formally proved in $\mathbf{\Sigma}$ means that *if agent a-priori knows that α*, then God exists. Thus, in the present article *existence of God is formally proved* within the *homogeneous* system of *a-priori knowledge exclusively*. Talks of *facts (=contingent truths)* and *empirical* arguments are not involved into the discourse of God’s being. This means that in the present article an abstraction from the empirical aspect of the problem under discussion is accepted and, consequently, the significance of the result obtained in this article is limited. Nevertheless, the above-submitted formal deductive inference is interesting theoretically and worth discussing among specialists with a view for further developing the analytic trend in philosophical theology investigations.

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Keywords: formal-axiomatic-epistemology-theory; two-valued-algebra-of-formal-axiology; formal-axiological-equivalence; a-priori-knowledge; existence-of-God.

The article deals with applying contemporary philosophical logic (the mathematized one) to analytic theology. A significantly novel machinery for a logical analysis of philosophical theology problems, namely, a formal-axiomatic-epistemology-theory Sigma, is introduced, defined, and exploited systematically. Definitions of Sigma's artificial-language-alphabet, terms, formulae, and axioms are somewhat unusual. Exact defining Sigma's semantics is unusual as well. These substantial novelties give quite a new possibility to logically prove God's existence under the condition that all the knowledge involved into discourse is an a priori one. In the present article, the mentioned formal proof is constructed within Sigma according to the formal-derivation-rules, and interpreted according to the mentioned semantics of Sigma's artificial language. Sigma is a result of a logical formalization of philosophical epistemology: that is why the exotic epistemic modality "agent *a-priori* knows that q" is involved into the discourse. The contrary epistemic modality "agent *a-posteriori* knows that q" is also included into Sigma and defined by its axiom-schemes; but, in this article, the author accepts an abstraction from *empirical* knowledge (agent knows that q *from experience*). Thus, the statement of God's existence is proved only within the a-priori-knowledge subsystem of the axiomatic theory under investigation. Although the scope of this result is limited, it is worth discussing among specialists. In contrast with the well-known "ontological arguments", the substantially new option of the formal-logical proof of God's existence given in the article may be called either a "formal-epistemological argument" or a "formal-axiological argument" because two-valued algebra of formal axiology is essentially exploited in it. The formal axiomatic epistemology theory Sigma synthesizes many qualitatively different modalities: alethic, epistemic, deontic, evaluative (axiological), etc. Axiological modalities "good" and "bad" are especially important in this article, since God is absolute goodness; He is necessarily good. Thus, axiological, alethic, and epistemic notions make up a synthesis explicated in this article by the Sigma formal axiomatic theory and interpreted according to the mentioned semantics of Sigma's artificial language.