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Galen's Logic: Aristotelian Heritage or Scientific Innovation?[1]

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The subject of inquiry is Galen's logical heritage where some aspects are distinguished which are closely connected with his medical practice. In this respect most interesting proved to be his views on hypothetical logics, especially from the point of view of his slogan 'Pay attention to things not words'. Galen thinks that there are three ways in which a pair of states of affairs might be related: they might be in conflict, in consequence, or in neither relation. This Galen's classification of relations between states of affairs might be represented in form of a specific ontological square. Traces of Galen's conceptions are trailing in modern logic particularly in the systems of non-fregean and relevant logics having situational semantics. Thus, in the framework of non-fregean logic from "Q situationally involves P" follows "if P then Q" (but not vice versa) which meets Galen's slogan. Rather different, more complicated situational semantics of relevant logic also displays the signs of Galen's logical attitude. Such semantics allows to take into account the closeness of relevant implication to the natural language conditionals while in Galen's reasoning we most often deal namely with conditionals which best of all describe the situations occurred during the disease diagnostics by virtue of its hypothetical nature. To some extent semantics of such conditional descriptions would be employed in computer medical diagnostics. In this case the modern physician inevitably should be a logician like he was in Galen's time.

Keywords*: proof, hypothetical logic, states of affairs, modern logic, situational semantics*

Galen on the Meaning of Logic

A quick glance Galen's works relating to logic (more than sixty works) is enough to understand that Galen took logic very seriously [1]. It is well known that Galen began studying logic at a relatively early age, and this early introduction to the discipline allowed him to easily get his bearings in problems of logic. However, his interest in the subject was not simply motivated by his natural intellect. Galen was of the opinion that knowledge of logic was necessary for any individual who wanted to become knowledgeable on any subject. He stated in his work *On Demonstration* the following: "If one is to go beyond an introduction to a method so that he masters it, he will find the truth in each piece of factual material" [2, XIX 59]. In his work entitled *"Quod optimus medicus sit quoque philosophus"*, Galen says the following about doctors: "to know about the nature of the body, about the various types of diseases, and to gain a thorough understanding of treatments, a doctor needs to practice logic" [3, p. 106]. When Galen speaks here about "logic", he is referring to a theory of demonstration. Demonstration is an inference made from fundamental principles or well-known truths as a set of premises. Through the use of deductive principles, this inference can lead to a conclusion, which then can be considered as proven. Galen's attitude to the method of logic is dictated by his certainty that logic is worthy of study specifically because it allows for the construction of proof.

It should be considered that "a philosophical view at the history of medicine presume the search for theoretical and philosophical foundations of medical knowledge, in addition to descresing the conditions that affect it's systematization" [4, p. 6]. According to Galen, doctors and philosophers try to uncover the nature of things, and because of this, they should understand and model these things, based on fundamental conditions

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and principles. Galen did not simply mean that doctors should employ common sense to avoid mistakes when diagnosing their patients or writing out prescriptions. More likely, he believed that the ability to come to a specific conclusion, based on fundamental conditions and facts, was a sign of a real doctor in the true sense of the word. This point of view, if we do not get bogged down in details, distinguishes Galen from his associates of the methodological and empirical sects in medicine[2], allowing us to approach him as a rationalist in light of the fact that his view on logic is extremely important for understanding the type of doctor he was.

Regardless of the fact that Galen's basic work on logic, "*Institutio Logica"*, was no more than a beginning textbook, it remains an extremely important work for the history of logic. Together with Apuleius' "*De Interpretatione"*, it belongs to the few works on logic that remain after Aristotle. Both works contain valuable information regarding the theories of logic of post-Aristotelian philosophers.

Galen on Demonstration

Galen believed that demonstrations have two defining features. First of all, their conclusions have general validity. Secondly, the premises on which these conclusions are based satisfy certain conditions.

The first means that a conclusion with general validity is one that can be reached by rules of deduction following from its premises. The second means that the premises of a demonstration should satisfy certain additional conditions (distinguished from those that are needed for making a direct conclusion). Demonstrations should follow from premises that are not only true, but that no one can doubt. Furthermore, Galen indicated that, in the given situation, he was speaking not of the layman, but of the expert.

The basic principles (or axioms) should be clear, and they should not require any sort of demonstration. For example, if we are trying to determine what can be the reason behind a defect of the eye, then we should not proceed by requiring proof for conditions that are already known by all reasonable people to be true. Together with similar fundamental principles (or axioms), any premise which is confirmed by our sensory perception is permitted in its own right and does not require any type of additional confirmation. Such premises may include statements, such as "speech is produced from the larynx", or even more complicated statements, such as "the passive absorption of air by various organs, muscles, and nerves, by means of this absorption, activates the organs designed for this action" [6, p. 72]. Similar facts can be gathered, in some sense, from experience (by observation of numerous examples together with the simple application of induction).

Because Galen devoted much of his attention to the use of logic to test the veracity of medical diagnoses, many other logicians of his time complained about his method of argumentation. Galen believed that logic was first and foremost an instrument for the deepening of our knowledge of medicine, geometry and other sciences. As is evident from the titles of his works on logic, Galen wrote many polemic works aimed at the written works of other philosophers and logicians. He was particularly hostile to the works of the Stoics, who he loved to accuse of creating interesting logical works that had absolutely no application in modern medical reasoning. He criticized them for their logical weakness, resulting from faulty reasoning leading to faulty schools of thought.

One who did not have the fortune to be educated from an early age in logic, had to simply

[2] Methodism was developed first by Thessalus in the 1st century, A.D. Methodism did not give any importance to concurrent and preceding circumstances of a disease, but emphasized the search for clear signs, referred to as "commonalities", indicating whether or not a disease was "stressful", "weakening" or a mixture of both for the body. The Empiricists, (at least the representatives of an early version of this philosophical school) believed that experience "empiricism" is the source of all medical knowledge. "Empiricism" is the observation and memorization of oft reoccurring and analogous situations during illness. This definition later included recommended knowledge as well. Regarding the rationalists, they believed that experience was too chaotic and diverse to use it as a basis for any useful conclusions, applicable to concrete situations. They held that for a diagnosis, the doctor needs to exclude unnecessary material from the basis of their methods. But, in this situation, a theory is required, and we do not have any method, allowing for the evaluation of sufficient empirical observations for the diagnosis of a disease. Furthermore, a doctor can derive a lot of useful information from experience, but the information does not constitute a sufficient basis for any sort of serious medical study. See Michael Frede's *On Galen's epistemology* [5].

trust what Galen said in his medical writings, avoiding the serious work of verifying the facts underlying his premises and principles.

Although Galen did not explicitly say this, it is clear that for the person who wanted to be a doctor it was necessary to possess knowledge (that is, medical competence), and not simply opinions about medicine. A good doctor, in this way, inevitably needed to be a logician as well.

Galen on Hypothetical Logic

As strange as it sounds, some scholars maintain that Galen, in reality did not understand logic. There is the astonishing opinion in regard to Galen's treatise on hypothetical logic (hypothetical syllogistics) that the work, as Ben Morison says "is unclear and foggy... Actually, it illustrates two important principles of Galen's system in logic – specifically that logic should be guided by things, as opposed to arguments, and it should only develop logical positions, which are useful for demonstration" [7, p. 91].

Galen's appeal to focus on things as opposed to words does not mean that he was indifferent to how a demonstration was constructed. He demanded that premises of deduction should be formed correctly, through the use of correct propositions[3]. The inability to correctly use propositions can lead to the appearance that a generally valid conclusion based on true premises has been constructed. However, upon closer examination, it is determined that a proposition has been used which leads either to a generally valid conclusion based on false premises, or an incorrect conclusion drawn from true premises. Of course, neither of these situations is what is needed.

At its foundation, the majority of Galen's comments regarding hypothetical syllogistics come down to the use of five syllogisms of the Stoics (none of which required demonstration). These syllogisms take the following form:

(1) If first, then second;
But first;
Therefore second.

(2) If first, then second;
But not second;
Therefore not first.

(3) Not both
(first and second);
But first;
Therefore not second.

(4) Either first,
either second;
But first;
Therefore not second.

(5) Either first, either second;
But not first;
Therefore second.

In this way, there are three types of examined argumentation: conditional (canonically argued through the use of proposals of the type "if first, then second"), disjunctive ("either first, either second"), and negative conjunctive ("not both (first and second)"). There is "one canonical formula for each type" of argument as well [8, p. 65].

It should be stated that, in the case of disjunctive arguments, Galen, ahead of the Stoics, used only strict (excluding) disjunctions. As is well known, in a remaining fragment of his works, Galen uses a term, designating a disjunction, and shows that the Stoics were insisting on the use of a special conjunction [9, p. 71, fr. 217]. Furthermore "it is not true ... that the Stoics did not know a non-excluding (non-alternative) disjunction. They did know. This fact is attested by a message from Aulus Gallias, in which a special term is used, introduced by the Stoics for the given type of proposal... According to Gallias, the Stoics believed this type of disjunction to be false" [10, p. 110].

Unlike the Stoics, Galen is not convinced that every assertion, using the word "if", should classify as conditional. He believes that there is an essential distinction between the assertions "If it is day, then the sun will be high in the sky" and "If it is not day, then it is night." He states without hesitation that the argument "If it is day, then the sun will be high in the sky" is a conditional argument, while at the same time, regarding the argument "If it is not day, then it is night", he says that "the form of the given argument indicates that it is conditional", and "he who deals only in words will consider this argument to be conditional, while, at the same time, he who deals with the nature of things, will consider it disjunctive" [11, III 5].

Galen's metaphysical picture of the world is based on and defined by relationships and dependences of states of affairs (things). Galen believed that there are three varieties of

[3] *Preposition* (prepositional position) – location of a dependent member before the governing member of the collocation, or of the syntactic word before the content word to which it relates.

relationships between two states of affairs: they can be in conflict, be dependent on one another, or have no relationship whatsoever. Two states of affairs are in "conflict" only if it is impossible for them to coexist. Two states of affairs "follow one from the other" only if they must arise together. Two states of affairs are not in conflict and do not follow one from the other only when it is both possible for them to coexist as well as for neither to exist.

The first two types of relationships can be further subdivided as well. In particular, two varieties of inter-conditionality are referred to as "absolute" and "non-absolute" consequences of each other. Two conditional states follow one from the other "in an absolute manner" when the appearance of the first absolutely dictates the occurrence of the second, and *vice versa*. They follow one from the other "in a non-absolute manner" if, upon the occurrence of the first, the second must occur, but not *vice versa*. Thus, "Dion is sleeping", and "Dion is alive" are non-absolute consequences of one another, while at the same time "John is alive" and "John is breathing" fully follow one from the other. It follows that, in stating "if John is sleeping, then John is alive" and "if John is alive, then John is breathing", we are using the same expression "if" for conveying two different types of logical relationships between states of affairs.

In regards to the conflict between the condition of affairs, Galen makes a distinction between absolute and non-absolute conflicts between states of affairs. Only assertions that reflect a complete conflict can be considered disjunctive arguments. At the same time, Galen did not consider assertions that reflect a non-absolute conflict to be disjunctive arguments, referring to them as "para-disjunctive". The basis for a "para-disjunctive" argument was that the two conditions of affairs influenced one another in a real sense. In other words, it appears that Galen was of the opinion that, in the case of absolute conflict, assertions of the type "if first, then second" present a real opposition. Thus, evidently, an assertion of an absolute conflict in the form of "either first, either second" simply cannot be false. As a matter of fact, what is really being considered here is a strict (alternative) disjunctive, and the Stoics (and Galen before them) believed only the non-exclusive variant to be a false disjunctive.

A number of authors believe it unnecessary to attribute to Galen the opinion that a disjunctive argument is completely defined by *real* relationships between conditions of affairs [8, p. 77–80]. All varieties of contextual factors help the listener understand the argument the speaker is making in regard to an absolute conflict between two conditions of affairs. In his attempt to understand what the speaker has said, the listener can try to determine which conditions of affairs are under discussion, and what types of relationships exist between them; however, this does not require that the listener understand on his own what is being discussed. Here it is necessary to distinguish the literal meaning of an argument and the meaning implied by the speaker.

In the present circumstance, the literal meaning comes down to the existence of a causal relationship between two conditions of affairs, and the speaker's task is to present to the listener probable candidates for explaining this causal relationship. Galen's stance on the necessity of dealing with things and not words relates to the present consideration in the following way. Here it is necessary to attend to the states of things that are being discussed, and to determine what kind of relationship exists between them, and only then shift our focus to the use of words in an argument. So, for example, if someone says "if it is day, then it is not night", then, in the opinion of Galen, the statement is based on the assertion that day and night exist in complete conflict. It is logical to believe that the situation implied by the speaker is a fact: day and night are in complete conflict. In the same way, the basis for the argument "If John is on Samos, then he is not in Athens" will be that the appearance of John on Samos and the appearance of John in Athens exist in non-absolute conflict (it is impossible to be in two places at the same time), and it may be that in a certain situation what is implied can actually be true.

Syllogism (3) caused Galen to seriously doubt its suitability as a demonstration. He gave the following example of its correct use:

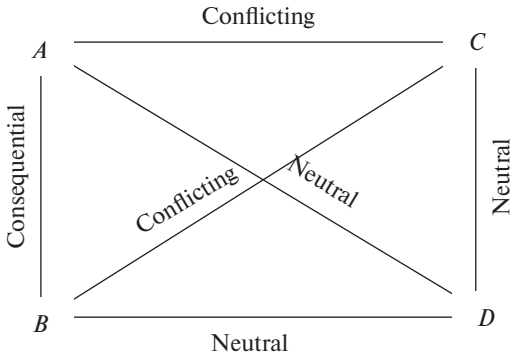
(6) It is not possible that Dion is walking, and that Theon is speaking;
But Dion is walking;
Therefore Theon is not talking.

In the first premise, the states of conditions are neutral to each other (they do not conflict with one another, and they do not follow one from the other) and they do not occur together. If we examine (6) as proof, then the premises should be true and it should be known to us that they are true (either from experience, or by way of logical conclusion). But, in as much as the states of conditions are neutral (that is, they are not connected to one another), then we judge the truth of the original condition on the basis of the truth of its separate constituents "Dion is walking" and "Theon is speaking", coming to the conclusion that they are not true concurrently. But if we know that it is true that Dion is walking, and that it is false that Theon is speaking, then we have our conclusion, and we do not need any sort of demonstration. If we know that it is false that Dion is walking, and true that Theon is speaking, then we already know the falsity of the second premise, and it is not possible to construct a demonstration, in as much as it would require that both premises be true. A demonstration is also not possible if we know that the first premise is true only by virtue of the fact that it is false that Dion is walking and false that Theon is talking. Hence, demonstration is only possible when it is not needed, in as much as knowledge of the truth of the first premise already involves knowledge of the truth of a conclusion.

Why then are hypothetical conclusions necessary at all for demonstration? Galen believed that they were only necessary at the first stage of establishing the existence of things that are not readily observable with our natural senses. It is a bit strange that on a few occasions Galen himself did not abide by this principle, using it arbitrarily in his treatises. For example, he wrote "If upon damage to the arteries we observe bleeding, then blood has either gathered in the artery, or it has come from somewhere else. However upon damage to the arteries, blood is observed, but blood has come from nowhere (as we will show later). Hence, it is contained in the arteries themselves" [12, IV 704–705]. But here he is not speaking of anything obvious, but rather making clear use of a hypothetical conclusion in the process of a detailed argument.

However, in other places, Galen clearly believes that hypothetical arguments are not suitable for proof. For example, in his work addressing the difficult issue of the location of the soul's active part [13, V 227–284], to show that it was located in the head, and not in the heart (as the Stoics held), Galen refuted the argument "If speech came from the brain, it would not be able to exit from the larynx" with the help of alleged evidence of two other assertions: "All that is distributed throughout something, is distributed throughout the parts connected to it" and "The mind is not connected to the larynx". The idea of demonstration comes down to the fact that hypothetical statements establish fact, the explanation of which is based on other, more general (and non-hypothetical) statements. Accordingly, a hypothetical argument can be eliminated from a demonstration for the purposes of a more general statement.

Galen's classification of the relationships between the conditions of affairs can be thought of as an original ontological square:



Here *A*, *B*, *C*, *D* represent a few conditions of affairs, "conflicting" signifies that the given pair are in a state of conflict (absolute or non-absolute), "consequential" signifies that each state follows one from the other (absolute or non-absolute) , and "neutral" signifies that two states of affairs neither conflict with each other, nor follow one from the other.

From Galen's discussion, it is clear that his pet theory of disjunctive, conditional, and conjunctive arguments significantly distinguishes itself from the theories of the Stoics, regardless of the fact that he adheres to the general principles of their school of thought and makes use of five of their standard syllogisms. In Galen's system, there are analogues to the majority of the Stoics' syllogisms, but upon close examination he did

not believe that all conclusions formulated in the manner required by the Stoics turned out to be, in fact, based on the syllogisms that they used.

The Non-Fregean Echo of Galen's Perspective

It is well known that "the history of science has many examples where subsequent use and development of ideas modify or completely transfigure the original meaning its creator initially intended and developed" [14, p. 29]. In modern logic, almost two thousand years after the life of Galen, his motto that the "logician should deal with things, and not words" has received unexpected acceptance in what is called Non-Fregean logic where relationships between states of affairs (situations) defines the approach to logic. Abandoning the Fregean meta-axiom, stating that the value (meaning) of a proposition is either "true" or "false", Non-Fregean logic examines situations as values of arguments and postulates that a logical implication corresponding with the proposition flows from an inverse relation of the inclusion of situation-values. This relationship is referred to as "referential implication" [15]. Thus, a conditional statement of the type "if *P*, then *Q*" in Non-Fregean logic is a corollary of the statement "*Q* referentially implies *P*" (but not *vice versa*) – things (states of affairs) dictate words (formal connection). This leads to the conclusion that the semantics of Non-Fregean logic are, and should be, guided first and foremost by connections between things, if it aims to produce logically correct and sensible demonstrations.

By their natural form, the concepts of states of affairs (atomic facts) and situations in Non-Fregean logic completely diverge from those implied by Galen. The founder of Non-Fregean logic, the Polish Logician Roman Suszko [16][4], based his system on an idea of Ludwig Wittgenstein, and had in mind a situational ontology that we find in his "Logical-Philosophical Treatise" – "2.0272. The Configuration of Objects Constitute Atomic Fact" [18, p. 42], "2.04 The World is the Aggregate of All Existing Facts" [18, p. 44].

Another version of Non-Fregean logic, belonging to the Polish logician, Ryszard Wojcicki, implies a standard theoretical-pluralistic ontology of first-order logic (a plurality with the aggregate of relationships assigned to it) whenever each of its interpretations of any relationship assigns a specified elementary situation (condition of affairs) [19]. Considering the fact that a combinatory ontology (defining everything as a combination of situations) is a similar ontology, it stipulates the absence of a distinction between situations and combinations (configurations) of situations. All of this amounts to situations, not distinctions between numbers of situations and a situation as such. Furthermore, the absence of extremely large (worlds) and extremely minor situations (an empty situation) is also accepted. The names of situations are added to language and this allows for the better realization of Wittgenstein's approach: all that we say, using these names, immediately finds its equivalent in our situational ontology and *vice versa*.

Within the framework of Non-Fregean logic it is possible to easily adapt Galen's theory of conditional propositions to become sequences of conditions of affairs following one after the other. In this instance, the occurrence of a second situation, if there is a first, may signify that the fist situation is a part of the second, that is, the first situation may referentially imply the second (situations here are referents corresponding to statements). But then from "*Q* referentially implies *P*", in Non-Fregean logic, we get the validity of "if *P*, then *Q*". In this way, "Dion is alive" referentially leads to "Dion is sleeping", and from here we conclude that "if Dion is sleeping, then Dion is alive", but not *vice versa*. This just happens to be Galen's example of a non-absolute sequence of conditions of related affairs, leading to the original conditional proposition.

In the case where the first situation is part of the second, and the second is part of the first, we get the validity of "if *P*, then *Q*" from "*Q* referentially involves *P*" in Non-Fregean logic, and from "*P* referentially involves *Q*", we get the validity of "if *Q*, then *P*", which is an example of Galen's complete sequence of one condition of affairs from another. In Non-Fregean logic this is an example of the so-called co-referential identity, from which an equivalence of two conditional propositions follows, that is, the statement "Dion

[4] See as well [17].

is alive is equivalent to Dion breathes." But from here it does not follow that "Dion is alive is co-referential to Dion is breathing").

Galen Motives in Relevance Logic

Traces of Galen's logical system can be found in the slightly different and more complexly structured situational ontology, used in the semantics of relevance logic. In this situational ontology, the condition of affairs is defined intuitively as a sort of fact-like essence that makes statements true in certain situations [20, p. 61]. In regard to actual situations, they are formed by the conditions of affairs that arise in each given situation, and in a number of paired situations, connected with the given situation. This all results in a system, in which situations do not exist on their own. Each of them occupies a particular place on a spectrum of specified connections assigned by a triadic (ternary) relation between situations.

This whole complex structure is designed to transfer the traits of conditional propositions in relevance logic, which, from the situational perspective, diverge from the conditional propositions in classical logic in the following way. It is the condition of affairs (connected in a triadic relationship with the conditions of affairs for its constituent) that responds to the conditional proposition. The universality of situations in which the positions of affairs arise is ordered, but this order is not absolute but dependent. That is, it is determined by a model subset of situations, referred to as *logical*. The domain of logical situations and the given domain closed in relation to the arrangement (this domain includes all situations related to the arrangement) are inherent in each atomic proposition.

For a conditional proposition of the type "if first, then second" there are three situations (thus, three conditions of affairs) relating to the ternary relationship of a sequence. These conditions of affairs can only arise all together, as stipulated by the "relevance" of our conditional proposition. That is, the condition of affairs, expressed by the propositions themselves, come into being only if the appearance of the condition of affairs for the "first" with necessity result in the appearance of the condition of affairs for the "second". In this way, the position of affairs "If it is day, then the sun is high in the sky" will be an absolute consequence of the necessity of a non-absolute consequence of the positions of affairs "it is day" and "the sun is high in the sky".

As mentioned earlier, it is possible to understand Galen such, that it is necessary to distinguish the literal meaning of an argument from the meaning, intended by the speaker when the literal meaning amounts to the existence of a causal relationship between positions of affairs, and the task of the speaker is presenting to the listener appropriate candidates for the explanation of this causal relationship. Thus, it is relationships between situations that provide the answer to Galen's literal meaning of conditional arguments in a relevant ontology, and the relationships between the positions of affairs, arising in given situations, are responsible for the meaning, intended by the speaker. It turns out that, from the very beginning, we must deal with a certain "exemplification" of situations with the help of the positions of affairs that is taken into account by a relevant ontology.

The structure of the conflict of conditions of affairs in the instance of a disjunctive proposition is more interesting. As we recall, Galen, following the Stoics, used only a strict (exclusive) disjunctive. In a relevant ontology, situations are in conflict only if they are connected by a special dyadic relationship. Furthermore, for each situation, there is a single conflicting situation, responding to the truth of a negative statement. Therefore, in the case of disjunctive propositions of the type "either first, either second", we have a condition of affairs that, in responding to the first, must be exclusively conflicting with the condition of affairs responding to the second that forbids the simultaneous truth of both the first and second. It is clear, for example, that "If is not day, then it is night" will be, in relevance logic, a conditional and not disjunctive proposition. The issue is that if the conditions of affairs "it is day" and "it is night" conflict, then the condition of affairs "it is day" in a relevant ontology will not conflict with the condition of affairs "it is night" (it is in conflict with "it is day"), and between the three corresponding situations, a ternary relationship of sequences is possible. In this way things and words correspond more easily with one another than they do in classical logic.

In regard to conjunctive propositions, the case of the syllogism examined above

(6) It is not possible that Dion is walking, and that Theon is speaking;
But Dion is walking;
Therefore Theon is not talking.

In a relevant ontology, upon the truth of the first premise in a certain situation *a*, in a conflicting situation *a**, it will be false that Dion is walking, but Theon is speaking. The falsity signifies that either both arguments are false, or that one of the arguments is false. But mutual falsity in *a** signifies that they are simultaneously true in *a*, and this incidentally negates the first premise. This means that only the second variant is possible. The second premise confirms the truth of one of the premises in *a*, and, in so doing, its falsity in *a**. From this follows the veracity of the conclusion.

Counterfactuals and the Problem of Diagnosis

One gets the impression that Galen's metaphysical depiction of the world was significantly influenced by his experience as a doctor. Medical practice required the examination of counterfactual situations and their factual consequences for the basis of a diagnosis. This aspect of practicing medicine is what inspired Galen's interest in hypothetical syllogisms. And, in medical research, Galen inevitably started from an ontology of a states of affairs when developing an argument. Therefore, his skill in logic was constantly fed by experience and empirical knowledge.

Adding to this argument is the fact that, in Galen's work we more often than not deals not simply with conditional propositions, but rather conditional propositions of a natural language (the so-called conditionals), prevalent in everyday discussion [21]. The conditionals of natural language have qualities that are fundamentally divergent from logical implications and consequences. For example, unlike logical implications and consequences, conventional conditionals are not transitive. Thus, you can use conditionals to say "If Vasily buys a new car, he will be practically broke", or "If Vasily wins the lottery, he will buy a new car". If the conditionals were transitive, then you could confirm that "If Vasily wins the lottery, then he will be practically broke", but this would be an absurd conclusion.

The standard point of view on conditionals requires a distinction to be made between counterfactual (counterfactuals) and indicative (indicatives) conditionals. We will examine the argument "If Yuri Gagarin was not the first man in space, then it was someone else". Evidently this proposition is true, and the author does not assume that the antecedent can be true or false (that is, that Yuri Gagarin was either the first man in space, or not). Here we are dealing with an indicative, the goal of which is only to indicate the person who was the first man in space.

An example of a counterfactual in the given situation would be the proposition that "If Yuri Gagarin was not the first man in space, then it was someone else". Here the author of a similar proposition first and foremost is implying that the antecedent should be false, that it is no more than a hypothesis, that we are simply entertaining as false (that is, that Yuri Gagarin was the first man in space).

Now we will examine the following passage from Galen: "If they shall honor the truth, and not Erasistratus, then they need to convince us that in his written work *On blood circulation*, he is speaking not simply about any illness, but rather expounding on [the methods for treating] any sort of inflammation in general" [3, p. 449][5]. Here we are dealing with an indicative, in as much as the goal of the given proposition is specifically an indication of Erasistratus, and not the truth or falsity of the antecedent. The problem is not related to whether or not they honor the truth or Erasistratus. It is only important that Erasistratus should have spoken about the treatment of any sort of inflammation, and not simply any instance of its possible variations. The passage from Galen, from this point of view, is equivalent to the argument "If not Erasistratus, then someone expounded on (in the work, ascribed to Erasistratus) the methods for treating any sort of inflammation in general".

In another place, Galen writes "I think that artificial vomiting should be prohibited, if the patient is suffering from headaches. And for someone whose body is so overfilled (with blood) that there arises a strong pressure along the legs and arms, it is impossible to reduce this surplus

[5] Galen. De venae sectione adversus Erasistrateos Romae degentes

through one fasting, especially when the patient is suffering from a stomach illness" [2, p. 459]. Here the first argument is undoubtedly counterfactual ("If the patient is suffering from headaches, then artificial vomiting should be prohibited"), when the second argument can be considered as counterfactual, if attention is given to the fact that the antecedent ("If someone has a body that is so overfilled (with blood), that there arises a strong pressure along the legs and arms") is, as a matter of fact, a hypothesis when the speaker chooses certain circumstances in which the consequent (" then it is impossible to reduce this surplus through one fasting") describes the actions in these circumstances.

If we recall Galen's motto regarding a focus on things as opposed to words, then, at first glance, it seems that, in the case of counterfactuals, it would be necessary to speak not just about the condition of affairs, but about the possible hypothetical conditions of affairs (that, however, require textual corroboration). On the other hand, if it is remembered that, in Galen's opinion, a hypothetical statement can be eliminated from a demonstration for another more generally explanatory statement, then the latter circumstance can be considered as a type of "localization" of hypothetical conditions of affairs in comparison to "general" conditions of affairs. In this case, it is as if the hypothetical conditions of affairs have retained the structure of the general conditions of affairs. And thus it is possible to consider this localization as the basis for Galen's use of a demonstration at the first stage for the establishment of the existence of things that are not obvious to our senses. It is surprising, but it happens that the last proposition is realized in the framework of the semantics of relevance logic when examining the theory of conditionals.

The standard point of view on conditionals is based on the idea that indicatives are examined as material conditions (in the sense that a classical implication is material), while counterfactuals are believed to be "global conditionals" (in the sense of all possible worlds). The simplest variant of this point of view, according to Robert Stalnaker, comes down to the assertion that the counterfactual "If there was a place *A*, then there would be a place *B*" is true only in a world closest to our actual world where if *A* is true, then *B* is as well [22].

The insufficiencies of a similar standard point of view are negotiated in the situational semantics of relevance logic, which demonstrate the close proximity of conditionals with a relevant implication. The ontology of a similar semantics is a situational ontology of relevance logic, augmented, first and foremost, by *possible* situations and a non-empty set of subsets of all possible situations (so-called propositions). That is, it is implied that the localization of hypothetical conditions of affairs transfers to situations, and its subset of situations corresponds to each proposition used in the conditionals. The arranged pair of similar positions (localized subsets of situations), corresponding to the antecedent and consequent of counterfactual arguments, is connected with the arranged triad of global situations by a five-part relationship, fixing the correlation of locality and globality of situations and conditionals. Thus, hypotheses are unable to bear on an entire world; they can only address its parts. However, it is postulated that after we have fixed the existence of a concrete connection between global and localized situations (that is, Galen's concept of the existence of things which are not perceived by the senses) with the help of our relationship of achievability, we can deal further with the global correlations between situations, defined by a typical triadic relationship of achievability in an ontology of relevance logic.

An ontology for a counterfactual is further augmented by the function, balancing its basic situations with each pair of propositions and a certain situation. This is required for it to be possible to reconcile conflicting (in the terminology of Galen) situations, and select those that will retain all of these characteristics in a global sense. Then, all hypotheses that are described as counterfactual will not violate the general structure of the given world.

If a world is chosen that corresponds specifically to the practice of medicine, then, when using such an approach, counterfactuals best describe situations arising in the process of diagnosing a disease, specifically by virtue of its hypotheticality. To some extent, the semantics of similar conditional descriptions could probably be used in computer diagnostics. In this case, it turns out that the modern doctor has just as much of a responsibility to be a logician as did the doctor in the time of Galen.

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