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THE MATHEMATICS OF LANGUAGES

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ABSTRACT

All languages could be successfully analyzed in terms of mathematical equations. In this sense, language is mathematics. This thesis enables us to explain why languages usually have different word orders, and why any language could be highly flexible.

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DIFFERENT WORD ORDERS AND FLEXIBILITY

Many scholars, such as Russell Tomlin and Jae Jung Song, discussed the diverse word orders of languages. Yet the fact that many languages have distinct word orders could be explained through discovering the hidden mathematical equations, according to which, the sentences of different languages are formed. For example, one basic mathematical equation of language is the following: subject + verb + object, i.e. S+V+O, are equal to grammatically accurate sentence, such as "I am eating an apple". In this example, "I" is the subject, "am eating" is the verb, and "apple" is the object. This linguistic structure or word order is common among many languages, such as English and Arabic. But since the equation S+V+O is equal to grammatically correct sentence, it mathematically follows that the equation S+O+V is also grammatically accurate. And it is so in several languages, such as Latin, German and Persian. In these languages, the subject comes first, while the object comes in the second position, and then the verb could be situated at the end of the sentence. Similarly, since S+V+O is equal to an accurate sentence, it follows that O+V+S, V+S+O, V+O+S and O+S+V should also be equal to grammatically correct sentences. And in fact they are grammatically accurate in different languages. Therefore, all languages could be successfully analyzed in terms of mathematical equations, and all languages are formed and/or used in light of mathematical equations, such as the equation S+V+O.

For instance, some languages use the word order object-verb-subject, such as the Native American languages: Apalai, Bakairi and Carijona. This shows that these languages are formed in light

of the mathematical and linguistic equation O+V+S. Other languages, such as English and Mandarin, use the word order verb-subject-object among other word orders. This indicates that they could be built and used in accordance with the equation V+S+O. Yet other languages are constructed in light of the word order verb-object-subject, such as the Hadza language in Tanzania and the Austronesian languages such as Malagasy and Fijian. This reveals that they are formed in accordance with the equation V+O+S. And there are other languages, such as Arabic, Hebrew and Hungarian, which use the word order object-subject-verb. This shows that these languages are built in light of the equation O+S+V. All of this leads to the general conclusion that all languages are in fact sets of mathematical equations.

Different languages usually have distinct word orders because their sentences are formed in accordance with diverse mathematical equations, such as the previous ones. It is a mathematical fact that the previous equations, holding between the subject, verb and object, follow from each other. So if the first human being used the equation S+V+O to construct his or her sentences, someone will ultimately infer the other mathematical equations entailed by S+V+O, leading to the formation of different word orders in diverse languages. In other words, the fact that the previous equations are mathematical, such that they follow from each other, explains why there are distinct word orders in many different languages. The same fact explains why any language could be flexible. Since the previous mathematical and linguistic equations, entailed by the equation S+V+O, follow from each other, it follows that the sentences of any language could be built in light of any single equation from the previous distinct equations. And thus, any language could be highly flexible.

ENGLISH LANGUAGE AS A SET OF MATHEMATICAL EQUATIONS

Since S+V+O are equal to grammatically accurate sentence in English language, it mathematically follows that O+S+V should also be equal to grammatically correct English sentence. And in fact it is, i.e. O+S+V form a grammatically accurate sentence in English. For example, Walt Whitman says in his poem "One's-Self I Sing": "One's-self I sing, a simple separate person / …The Modern Man I sing". Here, "One's-self" is the object, "I" is the subject, and "sing" is the verb. And "The Modern Man" is the object, "I" is the subject, and "sing" is the verb. As it is clear in each of these two poetic verses, the object comes first, followed by the subject, and then the verb comes at the end. This reveals that these two verses satisfy the equation that O+S+V is equal to grammatically correct sentence in English. This linguistic and mathematical equation appears in many of Whitman's poetic verses. For instance, he says in his poem "When Lilacs Last in the Dooryard Bloom'd": "trinity sure to me you bring", "And thought of him I love", and "A sprig with its flower I break". All of this shows that the equation O+S+V is a grammatically accurate equation of English, as the equation S+V+O is. And this is logical because the former mathematically follows from the latter.

From the same perspective, since S+V+O are equal to grammatically accurate sentence in English, it follows that the equation O+V+S should also be accurate. And in fact it is. Whitman says in his poem "Starting from Paumanok": "And a song make I…". Here, "song" is the object, "make" is the verb, and "I" is the subject. Therefore, this poetic verse is formed in light of the equation O+V+S, indicating that this equation is a grammatically correct equation of English language. In addition, since S+V+O constitute a grammatically accurate equation, it mathematically follows that V+S+O is a correct equation as well. One example of forming a statement in accordance with the mathematical and linguistic equation V+S+O is found in Longfellow's poem "The Skeleton in Armor". In this poem, Longfellow says: "Built I the lofty tower". In this verse, "Built" is the verb, "I" is the subject, and "tower" is the object. Here, Longfellow puts the verb at the beginning, followed by the subject and then the object. This indicates that this poetic verse is formed in light of the equation V+S+O. All of this shows that language is mathematics, and it is constructed and used in accordance with mathematical equations. And the fact that the relationship between the subject, verb and object is mathematical in the previous manner explains why any language, such as English, could be flexible in the

sense that it could be formed in accordance with the equations S+V+O, O+S+V, O+V+S and V+S+O.

The thesis that language is mathematics is applicable to all of the linguistic structures. For example, the linguistic structure subject-verb-adjective could be analyzed as a mathematical equation in the following way: subject + verb + adjective, i.e. S+V+A, are equal to a grammatically accurate statement, such as "The river is beautiful". Now, since S+V+A are equal to an accurate statement, it mathematically follows that A+V+S should also be grammatically correct. And in fact it is. This proves that it is plausible to analyze the diverse linguistic structures as being mathematical relationships. One example of the mathematical and linguistic equation A+V+S is Longfellow's poetic verse: "Silent, and soft, and slow / Descends the snow". In this verse, Longfellow puts the adjectives "silent", "soft" and "slow" at the beginning, followed by the verb "descends", and then the subject "snow". This shows that this verse is constructed in light of the mathematical equation A+V+S.

Longfellow uses the previous equation to form many of his poetic verses. For instance, in his poem "The Skeleton in Armor", he says: "Wild was the life we led". Here, "wild" is the adjective, "was" is the verb, and "life" is the subject. Similarly, in the same poem, he maintains that "Fairest of all was she". In this verse, "Fairest of all" is the adjective, "was" is the verb, and "she" is the subject. And this poetic verse is clearly built in accordance with the equation A+V+S. Other examples are from his poem "The Wreck of the Hesperus", such as his verses: "Blue were her eyes", "Colder and louder blew the wind", and "A frozen corpse was he". From the same perspective, since S+V+A are equal to grammatically accurate statement, it mathematically follows that A+S+V should also be grammatically correct. And in fact it is. For instance, Longfellow states in one of his poetic verses: "Loud then the champion laughed". Here, "Loud" is the adjective, "the champion" is the subject, and "laughed" is the verb. This poetic verse is, obviously, formed in light of the equation A+S+V. All of this reveals that the distinct linguistic structures could be successfully analyzed as mathematical equations.

ARABIC LANGUAGE AS A SET OF MATHEMATICAL EQUATIONS

The mathematical equation S+V+O (i.e. subject + verb + object) is dominant in Arabic language. But since S+V+O are equal to grammatically correct Arabic sentence, it mathematically follows that V+S+O, O+S+V, O+V+S, V+O+S and S+O+V should be grammatically accurate in Arabic. And in fact they are. If the equation S+V+O were not a true equation, then the equations V+S+O, O+S+V, O+V+S, V+O+S, and S+O+V would not have been true. But they are genuine equations of Arabic. Therefore, Arabic language is a set of mathematical equations, such as the previous ones. The relationship between the subject, the verb and the object is mathematical such that subject + verb + object is equal to a complete and accurate Arabic sentence, otherwise the equations V+S+O, O+S+V, O+V+S, V+O+S and S+O+V would not have been grammatically correct in Arabic, given that they follow from the equation subject + verb + object. And since the linguistic structures V+S+O, O+S+V, O+V+S, V+O+S and S+O+V follow from the equation S+V+O, it follows that the equation S+V+O successfully explains why the mathematical and linguistic structures V+S+O, O+S+V, O+V+S, V+O+S and S+O+V are grammatically accurate in Arabic language. Hence, the equation S+V+O has a strong explanatory power, leading to its acceptance.

For example, let us take "Al-Walado" (i.e. the child) as the subject, "Yakolo" (i.e. eats) as the verb, and "Al-Tofahata" (i.e. the apple) as the object. In Arabic language, the following sentences, which are constructed in light of the equations S+V+O, V+S+O, O+S+V, O+V+S, V+O+S and S+O+V, are grammatically accurate: "Al-Walado Yakolo Al-Tofahata", "Yakolo Al-Walado Al-Tofahata", "Al-Tofahata Al-Walado Yakolo", "Al-Tofahata Yakolo Al-Walado", "Yakolo Al-Tofahata Al-Walado", and "Al-Walado Al-Tofahata Yakolo". This shows that Arabic language is a set of mathematical equations, and its sentences are built in accordance with its mathematical equations.

The fact that, in Arabic language, the subject, verb or object could be correctly put in the first, second or third position in a sentence shows

that Arabic is highly flexible. The flexibility of Arabic had been discussed by some Arab linguists such as Al-Thaalibi. Now, Arabic language is very flexible in the previous sense because its sentences are formed in light of mathematical equations such as S+V+O, which entails that we can accurately have the subject, verb or object in the first, second or third position in a sentence. If Arabic sentences weren't constructed in accordance with mathematical equations, then Arabic wouldn't be highly flexible, given that mathematical equations themselves are flexible in the sense that several equations could be inferred from one single equation. This indicates that the fact that Arabic language is a set of mathematical equations successfully explains why Arabic is extremely flexible. And thus, the mathematical theory of language, which analyzes languages as sets of mathematical equations, gains an important virtue with regard to successfully explaining the flexibility of Arabic language.

In conclusion, language is mathematics in the sense that any language could be analyzed in terms of mathematical equations. And this is why languages are flexible, and there are different word orders.

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