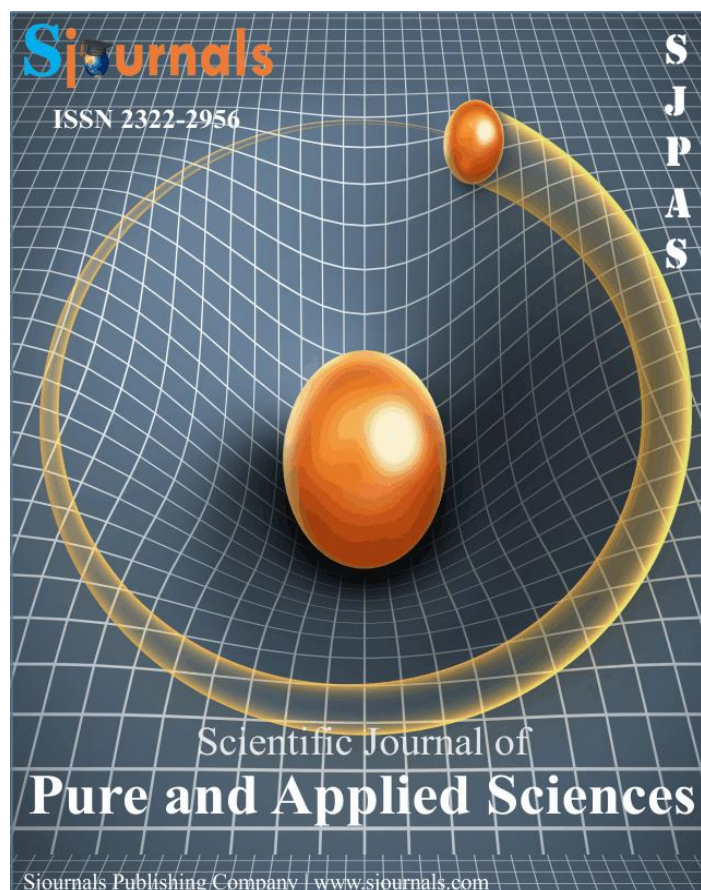


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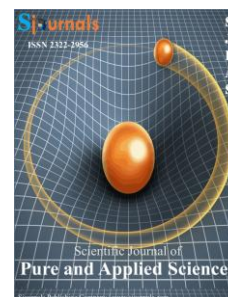
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### Review article

## Conceptualizing the phonology of sign language: As a matter of emphasis and elucidation

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### ABSTRACT

Like any other language, sign language is, among other things, guided by phonological principles involving several parameters combining in space to form lexical signs. According to Klima and Bellugi (1979), a simple lexical sign is essentially a simultaneous occurrence of a particular value of each of the several parameters. These parameters occur within a constrained signing space in combination with each other. William Stokoe (1960) equated phonology in oral language to what he termed cherology in sign language. However, most sign linguists prefer to use the term phonology. In oral language, phonology is the study of sounds, but in sign language, it is concerned with the parameters that make sign language a systematic and intelligible language system. One basic difference between oral and sign language is that in oral language we use words while in sign language we use signs. The other important difference is that while oral language is produced in the oral cavity using articulatory organs such as the mouth, sign language is produced in space using mostly the hands. Yet the structural difference is that while a phoneme in oral language is the basic unit of a word a chereme in sign language is the basic unit of a sign. In oral language words are organized sequentially while the signs in sign language are organized as a combination of simultaneously occurring components derived from several spatial dimensions. The purpose of this paper is to examine the parameters that characterize sign language and to demonstrate the formation,

vocabulary and organization of signs. The paper demonstrates how signs are executed in space. The paper addresses four major phonological (cherological) parameters of sign language, namely hand configuration (hand shape), place of articulation (location / position), movement and orientation. Major parameters save to distinguish very large classes of signs. In addition the paper articulates how these parameters combine to formulate meaningful signs within the constrained signing space. From the analysis, the author concludes that the phonology of sign language is highly complex and is resident in space as a function of the hand acting as a highly articulatory linguistic organ.

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## 1. Introduction

This paper explicates the parameters of sign language and demonstrates the execution of signs in space. Particular classes of signs are illustrated to provide a basic understanding of the phonological aspects of sign language. In this context, the concept of the signing space is examined as a guide to proper execution of signs. This also saves to endorse the systematic and rule governed or formal nature of sign language. In essence therefore, the paper explores the four major phonological (cherological) parameters of sign language including hand configuration (hand shape), place of articulation (location / position), movement and orientation. It is important to emphasize that the actions of all these parameters are executed in space. This is one most basic characterization of sign language after all.

## 2. Hand configuration or handshape

The first major parameter of sign language is hand configuration or handshape. Handshape refers to the shape of the hand used in a sign (Brentari, 2013). In sign language, a particular distinct shape is assumed by the hand to form a sign. The human hand is capable of assuming a vast array of possible shapes. It can be closed completely into a fist, fingers can be held together, the hand can be bent at the wrist, the fingers can be bent at the joint or knuckles, the thumb can be extended, held parallel to the fingers or held across the palm or fist. The index, middle, ring or little finger can be extended, bent or can be in contact with each other and so on. However sign languages tend to use a limited number of these handshapes. For example, in Zimbabwe Sign Language (ZSL), the shaking of a fist with thumb and index finger touching produces the sign for PEN. Handshapes are differentiated by spatial configurations of the hand. This is done by way of extensions, contacting or divergence of the fingers and the thumb. In this way, digits can also be arranged variously to form a vast array of static configurations. For Klima and Bellugi (1979). "The hand is a highly articulate organ". Its muscular structures permit differential extension as well as flexion at the individual joints of the thumb and fingers to form this array of shapes. Only a limited number of distinct handshapes are used in sign language. Brentari (2013) further observes that, for some isolated signs, the distinct handshape is assumed shortly before the onset of the sign and is, in most signs, maintained as a static feature.

The Dominance Constraint theory in the combination of parameter values provides that the non-dominant hand must either match the articulator in hand configuration or assume one of the six highly restricted but most common set of hand configurations. The six most frequently occurring hand shapes are /A/, /B/, /5/, /G/, /C/ and /O/. The six hand configurations are regarded as the most basic handshapes and account for 70% of all signs. These are also the first shapes to be mastered by children who are deaf. This is because these handshapes function less restrictively, are less confusable and are the most frequently occurring.

Based on American Sign Language (ASL) and the ZSL phonologies, there are two categories of types of similar handshapes. Category A is further composed of three groups, the compact handshape, broad handshape and the index handshape groups. The compact handshape group is made up of hand shapes which have the 3 middle fingers bent or closed as follows: /X/, /M/, /N/, /O/, /C/, /E/, /A/, /S/, /T/, /Y/, /I/. The broad handshape group is

made up of handshapes which have at least three fully extended fingers, one of which is always the index finger. The handshapes are as follows: /3/, /4/, /5/, /8/, /B/, /F/, /L/, /P/, /Q/, /W/.

Then, the index handshape group is made up of handshapes which have one or two fully extended fingers of which one is always the index finger. The handshapes are illustrated as follows: /1/, /2/, /7/, /D/, /H/, /U/, /V/. Category B is composed of adjacent handshape or extendedness continua handshape groups whereby one of the fingers may not necessarily be fully extended. There are three groups forming this category as follows:

- (a) /O/, /L/, /G/, /D/, /X/, /A/
- (b) /B/, /C/, /E/, /O/, /A/
- (c) /5/, /8/, /Y/, /I/, /A/

### 3. Place of articulation (Location)

The second major parameter is place of articulation or location of a sign. Location is the position of the hand on the body or in the space in front of the signer's body. According to Klima and Bellugi (1979) the primes of place of articulation in sign language are definable with respect to particular locations and areas on and around the body within a delimited region called the signing space. Like handshape, there are a great number of different loci on the body and space but signers tend to use those within the constraints of the signing space. The signing space is bounded by the top of the head and the areas just above the waist as well as a comfortable radius to the front and side of the body. By definition, signing space refers to the area which extends vertically from approximately just above the head to the waist, and horizontally from elbow to elbow when the arms are held loosely bent in front of the body (Felon et al., 2016). It is in this area that the hands and arms can move and make contact with the body and with each other easily and naturally. A sign can therefore be located on the body or anyway within the signing space. The position of the hand is described in relation to this signing space which is illustrated later in this paper. Primary locations occur on or in proximity to the body, often with the use of one hand while secondary locations occur on or near the hands often with the use of both hands. In general, signs are made in any of the following locations: Top of the head or forehead, upper face, whole face, eye, nose, cheek, ear, mouth and lips, neck, shoulder, elbow, arm, hand and lower trunk.

According to Stokoe (1960)'s analysis of the American Sign Language (ASL) there are 12 places of articulation on primes that minimally distinguish different pairs of signs. In the facial region differentiations are made on the mid-face region, the lower face, the cheek and the whole face (Fenlon et al., 2016; Lillo-Martin and Gajewski, 2014). The other distinct places of articulation are the neck, the trunk, the upper-arm the lower arm, the wrist and the second hand. The final place of articulation is described as the neutral space and is in front of the torso.

Meanings of signs are relative to the location of the signs. For instance, mental signs are executed on the forehead. According to Chimedza et al. (1998) signs that occur near the forehead are linked to thinking and imagination. Examples of mental signs are think, know, wise, forget, remember, misunderstand etc. Similarly, emotional signs are generally those that relate to qualities and feelings. They are executed over the heart or generally at the chest level. Examples of emotional signs are love, feel, pity, sorry, grief etc. In the same vein, gender signs are those that denote male or female. The right temple is used as the region for the male gender while the right cheek and chin is for the female gender (Hoemann, 1983). However, it does not mean that all signs executed on the temple are necessarily masculine and all those that are executed on the cheek and chin are necessarily feminine. For the signs denoting the acts of seeing are executed near the eye, those denoting the acts of hearing are executed near the ear and those denoting the acts of speaking testing or eating are executed near the mouth.

### 4. Hand movement

Hand movement is the third major parameter in sign language phonology. Movement is a very important aspect of sign formation. Changing a movement alters the meaning of a sign. Hands may move upwards, downwards, to and fro, in an arc, circular or spiral formation. Try these movements yourself! According to Klima and Bellugi (1979), movement is the most complex and most difficult to analyse of the major parameters of sign structure. As such, if the movements of signs are compared as global wholes, the differing shapes, tempos, directions, oscillations and dynamics of the motions appear extremely rich and varied. Many movements of signs

through space follow a single path or local movement, while others need complex combinations of the movement (Brentari, 2013; Fenlon et al., 2016). In Stokoe (1960)'s analysis, there are 24 movement components in Sign Language, which occur singly, simultaneously or in sequence within single monomorphemic signs. Monomorphemic signs are those that convey meaning on their own. The changes of movement can be viewed as inflections on the internal structure of the sign which change the meaning of the base concept. For Newell et al. (1989) it is the changes in intensity, speed and duration of a sign movement which create modifications in meaning. Through this way, signs are modified to make more complex meanings. For example, 'day' is changed to 'daily', '5 days', 'long day' etc.

There are often five legitimate hand movements that include hand internal, wrist, directional, circular and interactional movements. Hand internal movement involves different articulations of the fingers. Thus the fingers may wiggle or bend, or they may open or close into smaller or larger shapes. Wrist movement consists of supinating, pronating, twisting (oscillating), nodding or rotating actions of the wrist to make signs. Supinating is turning the wrist palm-side up, pronating is turning the wrist palm-side down and oscillation consists of twisting movements. Directional movement entails moving the hand(s) along pathways in space. Thus movements can be upward and downward, to and from or side to side with respect to horizontal, vertical and bilateral planes in the neutral space (Brentari, 2013; Klima and Bellugi, 1979). Circular movements can be performed using the whole manual articulator, that is, from shoulder to hand. The movements can also be made by pivoting the fore arm at the elbow or swelling the hand at the wrist. Vertical parallel circular movements are made parallel to the signer's body while vertical angular circular movements are at angles to the signer's body. Horizontal circular movements are made parallel to the ground. Interactional movement occurs when the hands or the hand(s) and body move toward each other, interchange, contact each other or grasp and separate.

## **5. Clusters of movement**

There are six clusters of movement. Thus the types of single movement components that have just been described by no means fully describe the movement of signs. Instead, there are several signs with clusters of movement components. Felon et al. (2016) postulate that to fully describe the movement signs, it is necessary to describe, not only the components of movement, the movement types, but also the dynamic qualities, manners and frequencies of those movements. Here we outline five clusters of movement components. Simultaneous clusters occur when two movements are executed at the same time. Examples of simultaneous clusters of movement components include circling while in contact, opening hand while moving toward the body, twisting wrist while in contact, grasping while moving the hand upward or downward etc.

Sequential clusters occur when a sign has more than one movement component side by side. A sequential combination shows actions that are executed one after the other. Combination clusters involve signs that have both simultaneous and sequential movement clusters. Bi-segmental signs occur when some simplex signs are described as if they were two sign units with specification for hand configuration (HC), place of articulation (PC) and movement followed by another specification. They often involve change in orientation, location or direction. Consequently, these clusters of movement are bound to be characterized by some constraints.

## **6. Constraints on clusters of movement**

Brentari (2013) postulates that not all the combinational possibilities are realizable. Some combinations are simply incompatible for physiological reasons, while others can be excluded on the basis of Sign language specific patterning. The symmetry constraint together with the dominance constraint was posited by Battison (1974). The symmetry constraint specifies that, in a 2-handed sign, where both hands move and are both active, they should perform roughly the same motor act. The dominance constraint provides that, the non-dominant hand must either match the articulator or dominant hand in HC or assume one of the six most basic hand shapes. It is applicable to the class of signs in which one hand acts on the other which in turn would act as a PA. In this regard, the non-dominant hand is severely restricted with respect to shape. The symmetry and dominance constraints, thus greatly limit the combinational possibilities in Sign Language. However, Sign Language exploits the dimensions of the spatial mode, which is lacking in oral language, to create visible shapes moving in space. These shapes (signs) reveal their mimetic origins yet they are systematically and formationally restricted (constrained).

## 7. Orientation

Orientation being the fourth and final parameter primarily refers to the directions of the palm and knuckles with respect to the signer's body. Some authorities do not regard orientation as a major, but a minor parameter since it is somewhat a classification of HC. Palm orientation can be downwards or upwards, left or right, or away or toward the signer's body. Hand orientation describes the direction the hand is facing. There is also left-right orientation which refers to whether the signer is left or right handed (Chimedza et al., 1989). In signs made in space without physical contact, the orientation of the hand(s) alone may distinguish pairs of otherwise identical signs. On the whole, there are limits to the number of each major parameter that can be incorporated into a single sign and there are rules governing hand configuration so as to produce a recognizable Sign Language sign. Palm orientation is represented in the following figure (Fig. 1).

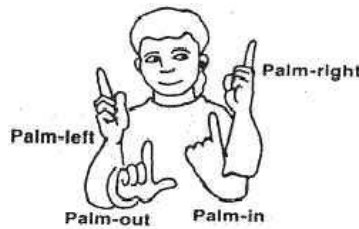


Fig. 1. Palm orientation.

## 8. The signing space

As has already been highlighted, signs generally fall within a signing space bounded by the top of head and the areas just above the waist, with the space towards the sides and front of the body defined by a comfortable but not fully extended reach of the arms (Fig. 2). By definition, the signing space refers to an area which extends vertically from approximately just above the head to the waist, and horizontally from elbow to elbow when the arms are held loosely bent in front of the body ([http://www.ureca.recherche.univ\\_lille3.fr/sparrow/docs/phonology\\_signed\\_laguage.pdf](http://www.ureca.recherche.univ_lille3.fr/sparrow/docs/phonology_signed_laguage.pdf)). Brentari (2013) reiterates that, signs tend to be executed within a certain definable region or space relative to the signer's body. The author observes that most signs are executed between the waist and the point just above the forehead and within easy reach of the signer's left and right. In a way, signs are made within a highly restricted space defined by the top of the head, the waist and the reach of the arms with shoulders bent. So, when the hands move through this space to produce signs, the movement is regarded as the movement of articulatory carrying phonologically definable articulation instructions (Lidell, 2000). Very few signs are executed above the head or below the waist. Signs are also not executed far out in front of the body but within a comfortable distance with bent shoulders. Thus, when constructing a Sign Language sign, hands should not reach high above the head or below the waist or outward to the full extension of the arms. Within the signing space are the neutral space and the high space. The neutral space is the area in front of the chest, but not touching the body while the high space is the area at the level of head or face, that is, the area above shoulder level.

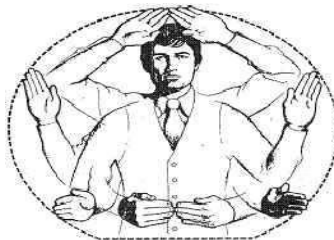


Fig. 2. The signing space.

The visual center of the signing space is the nose-mouth area. Many signs are made in close proximity, but seldom within the visual center. The logic behind the visual center is that visual acuity is sharpest near the visual center. Thus, blockage of the mouth area may reduce efficiency of communication. Research has shown that, the

face and the mouth area are important features for grammatical expression in sign language (Caccamise et al., 1982) hence the importance of the visual center of the signing space. In effect, signs made near the visual center of the signing space tend to have finer distinctions for all phonological parameters than the signs that are executed in the periphery. This is based on the theory that, the probability of perceiving detained information is greatest in areas of high acuity and in areas which have a large number of visually distinguishable landmarks (Brentari, 2013; Hoemann, 1983). In other words smaller motions and distinctions among signs are most distinguishable in areas close to the visual center.

However, there are occasions when the signing space may be violated. In any case, the basis for the signing space is probably largely more physiologic than systematic. That is, signs can be executed within a region which is most comfortable for the signer. For this reason, constraints based on human physiology affect the articulation of signs. For example, a tall person with long arms is likely to encompass more space than one who is short. Similarly, an exuberant person would extend his/her signing space more than a shy or withdrawn person. Further, a signer before a large audience is likely to widen the signing space while a signer who is engaged in an intimate or private conversation may constrict the signing space in order to conform to the mood of the situation. Additionally, concomitant physical disability may also influence the extent of adherence to the constraints of the signing space. Hoemann (1983) elaborates, "Violations of the normal constraints imposed by the signing space may function as meaningful cues to the signer's intent." For example, extending one's arms beyond the signing space may be indicative of a noticeable amount of emphasis or hostility in the message. This may also act as a rhetorical device for attracting special attention to or special treatment of the issue at hand. After all, sign language does permit a variety of signing styles ranging from very casual and intimate to very formal styles (Stokoe, 1972). Within this continuum, formal styles are far more likely to be accommodative of the constraints of the signing space than the casual and intimate styles.

### **9. Symmetry of phonological parameters**

Generally, signs made near the visual center of the signing space tend to be one-handed while signs made near the periphery tend to be two-handed with both hands performing symmetrical major phonological parameters. Thus, duplication of signs using symmetrical hand shapes, movements, positions and orientations is of greater importance for signs made in the periphery as opposed to the signs made closer to the high acuity visual center of the signing space (Brentari, 2013; Fenlonetal, 2013; Cuccamise et al., 1982). Handshapes are considered symmetrical when the hands assume similar shapes and positions are considered symmetrical when hands contact the same position or the corresponding positions on either hemisphere of the body. By the same token, movements are considered symmetrical when the hands have the same basic movement, either in the same or opposite direction while orientations are considered symmetrical when the orientations of the hands are the same or are reciprocal. From the foregoing analysis, it is advisable that, in one handed sign languages such as ZSL and ASL one uses one hand with the position toward the periphery for signs executed in the neck and face area or both hands having identical hand shape for signs executed below the neck. In order to intensify the phonology of sign language, non-manual markers or features of sign language are used in combination with signs.

### **10. Non-manual markers of sign language**

It is not only the hands that are used in the expression of the phonology of sign language. The head, shoulders, eyes, eye brows, nose, mouth, cheek, lips, mouth corners, tongue, teeth, and the torso are all used to make effective sign language communication. These are the non-manual features of sign language. In addition to these parts of the body the signer can use inflection and emphasis and stress to reinforce communication. Inflection, emphasis and stress are not purely non-manual, but are characterized by a non-manual aspect of sign language. Inflecting a sign involves varying the degree or intensity of movement and using appropriate facial expressions (Maier et al., 2013; Bellugi and Newkirk, 1981). Inflection is thus expressed by modulating movement of a sign and making a facial expression which together change the meaning of the sign. Generally, signs are inflected by facial expression, movement and modification. According to Chimedza et al. (1989), inflections are content related and in addition encompass exaggeration of non-manual features. The modifications of hand movement that characterize inflection denote diacritics which are analogous to minimal pairs in English. Minimal pairs in oral language are words that differ in one letter. Examples are rat/pat, dog/dot etc. In other words, inflections are used

to minimally distinguish between similar signs. Research has shown that inflection is of great importance in sign language. Hoemann (1983) earlier speculated that, in sign language, there is an interesting possibility of expressing the semantic content of a message manually at the same time indicating by means of facial and body cues how one feels about it. In this way, sign language is able to present both the message and the subjective editorial comment in the visual channel.

Emphasis and stress can then be reflected in the variation of a sign or by exaggeration. Along with exaggeration, for instance, the signer may slow down the execution of the sign to indicate stress or emphasis. Execution of emphasis by exaggeration often violates the units of the signing space. Facial cues can also be used to express, emphasis and/or stress. This is analogous to the contribution made to an oral language statement by the tone of the voice. Strategies for adding emphasis and stress to the adjective may include a flourish to the sign, modification of the execution of the sign, a facial cue or other non-manual stress signal to the sign or an effective display after the sign has been executed.

## 11. Discussion and conclusion

It is clear from this analysis that sign language is guided by principles that make it an orderly and conventional language semantically, syntactically, phonologically, morphologically and pragmatically. Sign language is not chaotic as some people suspect, but overly systematic. However, any violation of its principles can make it as chaotic as its critics would like. For instance, signs of sign language are executed within a definable signing space. However, when it comes to the violation of this signing space, one can argue that the violation may act as a resource for more meaningful linguistic expression. Thus the parameters of sign language form the basis of linguistic principles that are analogous to the phonological systems of spoken languages. These signs are an orderly collection of meaningful units that conform to morphological processes that underlie any other conventional language system. From the analysis, the author concludes that the phonology of sign language is highly complex and is resident in space as a function of the hand acting as a highly articulatory linguistic organ.

## References

- Bellugi, U., Newkirk, D., 1981. Formal devices for creating new signs in ASL. *Sign Lang. Stud.*, 30, 1-35.
- Brentari, D., 2013. Handshape in sign language phonology. In van Oostendorp, C., Hume, E., Rice, K. (eds) *Companion to Phonology*. New York/Oxford: Wiley-Blackwells.
- Chimedza, R., Sithole, C.Z., Renashe, H.M., 1989. *Zimbabwe national sign language dictionary* (Vol. 1). Harare: Ministry of Education, Sport and Culture.
- Cuccamise, F., Newell, W., Mitchell-Cuccanise, B., Dutermans, L., Pocobello, D., Smith, N., Aron, B., 1982. *Technical signs: Manual 1*. St Petersburg: Modern Talking Picture Services.
- Felton, J., Cormier, K., Brentari, D., 2016. The phonology of sign languages. In Bosch, A. (ed). *Routledge Handbook of Phonological Theory*. New York: Routledge.
- Fenlon, J., Schembri, A., Rentelis, R., Cormier, K., 2013. Variation in handshape and orientation in British sign language: The case of 'l' hand configuration. *Lang. Comm.*, 33, 69-91.
- Hoemann, H.W., 1983. *Communicating with deaf people*. Baltimore: University Park Press.
- Klima, E.S., Bellugi, U., 1979. *The sign of language*. Cambridge: Harvard University Press.
- Lidell, S.K., 2000. Indicating verbs and pronouns: Pointing away from agreement. In Emmory, K., Lane, H. (Eds). *The signs of language revisited: An Anthology to Honour Ursula Bellugi and Edward Klima*. London: Lawrence Erlbaum Associates.
- Lillo-Martin, D.C., Gajewski, J., 2014. One grammar or two? Sign languages and the nature of human language. *Wiley Interdiscipl. Rev.*, (5), 387-401.
- Newell, W., Holcom, S., Holcomb, B.R., Pocobello, Boardman, K., Arthur, L., 1989. *Basic sign communication*. Maryland: National Association of the Deaf.
- Stokoe, W., 1960. *Sign language structure. An outline of the visual communication systems of the American deaf*. Maryland: Linstok Press.



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