Uriovakiro: a Polysyllabary for Rotokas

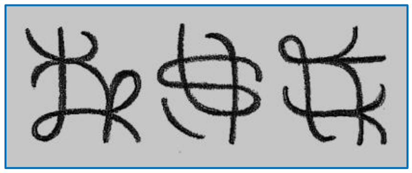


Diagram 1: "Uriovakiro" in Uriovakiro

Background Information:

The Uriovakiro script was designed exclusively for a dialect of the Rotokas language (Central Rotokas), spoken by about 4,000 people in Papua New Guinea. Incidentally, the name "Uriova-kiro" comes from the Rotokas words for "bug" and "writing" respectively. This refers to the fact that many of the symbols resemble insects.

The first of its kind, Uriovakiro is herein labelled a "polysyllabary." A polysyllabary is an original type of writing system conceived of in 2013 and 2014 by Sheldon Ebbeler, a linguist and analyst of verbal behavior. (For more information on polysyllabaries, or other scripts constructed by Sheldon Ebbeler, please contact the author at sheldonebbeler@yahoo.com.) The primary intent of this new writing system was to explore the possibility of extending the classification of writing systems. That is, the traditional broad classes of phonetic writing systems (essentially, "featural," "alphabet," and "syllabary") do not strictly apply to this conscript.

Notable Features:

- Type of writing system: Polysyllabary
  (That is, the terms "alphabet," "abugida," "syllabary," etc. do not apply.)

- Direction of reading: Each Uriovakiro symbol is comprised of (up to) 2 syllables. These symbols are arranged from left to right.

- Language(s) that can be written with it: Central Rotokas
  (also known as the "Rotokas Proper" dialect)

How is a polysyllabary (and, in particular, Uriovakiro) different from conventional writing systems?

Featural scripts, alphabets, and syllabaries capture more and more phonological material within any given written form, to a degree that increases for each type of system along the phonetic writing system continuum. Polysyllabaries are a straightforward extension of this pattern.

(1) **Featural** scripts offer the most detailed distinctions, such that phonological features (below the level of the segment) correspond to particular graphic features. One example is Bell's Visible Speech, for which a unique written aspect corresponds to each manner and place of vocal production. For example, with this script, the graphemes for [t] and [k] resemble each other in that both contain the component characteristics corresponding to "voiceless stop consonant."

(2) With **alphabets**, the segments themselves get set individual shapes; however, unlike with featural scripts, there is no further correspondence between phonetic and graphic features below the level of the segment.

For example, with the Latin alphabet, while there exist consistent graphemes for [t] and [k], these symbols do not resemble each other in a non-arbitrary fashion.

(3) **Syllabaries** are the next level of phonetic writing system. With these, however, not only are phonological features not systematically captured; syllables containing the same segment are assigned formally-different graphemes as well. That is, with a pure syllabary, each syllable has its own unique written form regardless of the segments that a syllable has in common with another. For example, with Japanese katakana syllabograms, the written symbols for [ki], [ke], [ka], [ko] and [ku] do not resemble each other in a systematic fashion despite that the spoken syllables all contain the segment [k].

(4) Expanding this continuum, we could imagine a further level of poly-phonemic writing system that employs symbols uniquely corresponding to sound groupings *above* the level of the syllable (e.g, symbols for combinations of 2 syllables). Although such systems* are not known to exist naturally, Uriovakiro is an attempt at a script systematically constructed to explore this possibility: a **polysyllabary**. That is, Uriovakiro has symbols for not only Rotokas monosyllables (i.e, "monosyllabograms") but also disyllables (i.e, "disyllabograms").

> * NOTE: There are writing systems that encode *semantic* information instead of (or in addition to) *phonetic* information (e.g, logographic systems, like Chinese). However, this is not what we are referring to here.

Below, the sounds in the English word /tako/ are transcribed to exemplify these 4 types of writing systems. The systems shown here are (1) Bell's Visible Speech, (2) the Latin Alphabet (as used for English), (3) Katakana (displaying Japanese), and (4) the Uriovakiro polysyllabary (for Rotokas).

Diagram 2. /tako/ transcribed using Visible Speech, the Latin Alphabet, Japanese katakana, and Uriovakiro

<u>The Phonology of Central Rotokas</u>:

The systems of phonology and phonotactics for Central Rotokas are close to ideal for a potential candidate for a polysyllabary. Having no nasal consonants, this dialect of Rotokas has one of the smallest known phonetic inventories (arguably second only to the Pirahã language). Moreover, the phonology is simplified further due to the fact that no manner contrasts are significant between consonants; that is, a difference in voicing plus 3 place distinctions differentiates the 6 consonant phonemes. While Rotokas employs the very common 5-vowel distinction, the Central dialect possesses a length contrast that effectively doubles the vowel inventory suprasegmentally. However, while such long vowel contrasts are common for the spoken language, native speakers of Rotokas often ignore the orthographic convention available to distinguish between long versus short vowels (Robinson 2011). Furthermore, if such an orthographic convention is desirable (for example, in the interests of a more complete writing system), a systematic alteration to the short vowel forms will suffice. Other suprasegmental distinctions (notably, stress and tone) are not contrastive. Finally, the allowable syllable structure is maximally simple. While earlier work (e.g, Firchow 1987) proposed the possibility of diphthongs, more recent work (i.e, Robinson 2011) reanalyzes sequences of 2 different vowels as belonging to 2 separate syllables. The Uriovakiro conscript subscribes to this analysis, such that only CV or V syllables are phonotactically permitted (where V includes long vowels). These facts drastically decrease the possible number of monosyllables as well as disyllable combinations, which, in turn, reduce the number of disyllabograms required to encode the spoken language.

Central Rotokas Phoneme Inventory

	Bilabial	Alveolar	Velar
Voiceless	p	t	k
Voiced	v	r	g

	Front	Central	Back
Close	i ii		u uu
Mid	e ee		o oo
Open		a aa	

Diagram 3. The Phonology of Central Rotokas

Here is the phonological system for Central Rotokas. This chart identifies the values for the two distinctive feature types (place and voicing) for each of the 6 consonants of each language. Below this, the vowel chart displays all vocalic contrasts: the 5 basic contrasts plus the 5 long vowel distinctions. The graphemes shown here illustrate how the Latin alphabet is traditionally used to represent the sounds of this dialect. (Not shown here, the grapheme ‘t’ conventionally becomes ‘s’ before [i], though these allophones correspond to a single phoneme.) Note that, because there are no true manner contrasts, allophonic variation is sometimes considerable. For example, while the voiced bilabial consonant is commonly represented with grapheme ‘v,’ the range of allophones signified by this symbol includes /b/, /m/, and /β/.

<u>Morphophonology:</u>

When Rotokas words are parsed into 2-syllable combinations, word boundaries and morpheme boundaries are respected. Thus, the inflected verb *aio+ri+vora* “eat you long-ago” is parsed into 4 symbols as *a.i; o + ri + vo.ra*, where:

- **.** = a syllable boundary,
- **;** = a “disyllable boundary,”
- **+** = a morpheme boundary, and,
- **-** = a dash or a space.

As such, *o* and *ri*, which belong to different morphemes, are written as separate symbols (that is, not contained within a single disyllabogram though adjacent monosyllables). This being said, common pairs of monosyllabic function words or clitics that often occur together may be written as contained within a single disyllabogram. For example, in the similar inflected verb *aio+ri+vo* "eat you recently," the two monosyllables *ri + vo* may be written as one disyllabogram. (This is directly akin to how fusional languages frequently employ a single affix or morpheme to convey multiple meanings.)

<u>5 Syllabogram Templates and 8 Basic Quadrant Forms:</u>

With the Uriovakiro writing system, syllabograms (that is, the symbols representing a sequence of 1 or 2 syllables) are compositional. In other words, these symbols are not completely arbitrary or randomly engineered. Rather, Uriovakiro employs 5 fundamental syllabogram templates to create every unique composite figure by coalescing smaller component forms. The particular template utilized depends upon which type of disyllable or monosyllable is being represented: (1) cv.cv, (2) v.cv (or cv.v), (3) v.v, (4) cv, or (5) v. (Recall here that the period indicates a syllable boundary.)

Each syllabogram template is divided into 4 equal areas. A particular quadrant form occupies each of these 4 areas. Not surprisingly, these 4 areas largely correspond to the 4 phoneme segments in the sequence of 2 syllables. The 8 basic quadrant form possibilities correspond to the most common Rotokas phoneme possibilities: 3 consonant forms {p/v, t/r, k/g} and 5 short vowel forms {i, e, a, o, u}. (Additionally, there are 5 long vowel forms {ii, ee, aa, oo, uu} that can be systematically derived from the short vowel forms.) Here are the 8 basic quadrant forms that attach to the templates below in order to create a composite syllabogram:

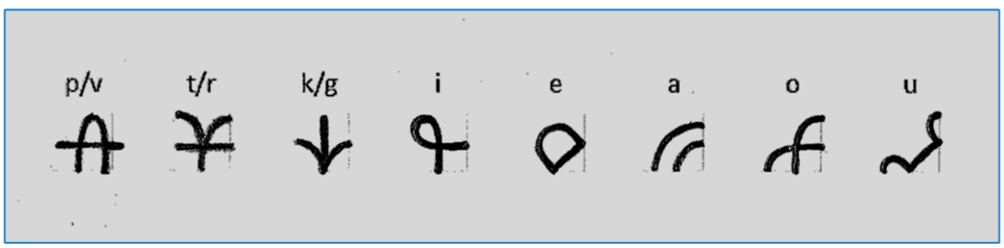


Diagram 4. The 8 Basic Quadrant Forms

Below are the 5 templates for syllabograms:

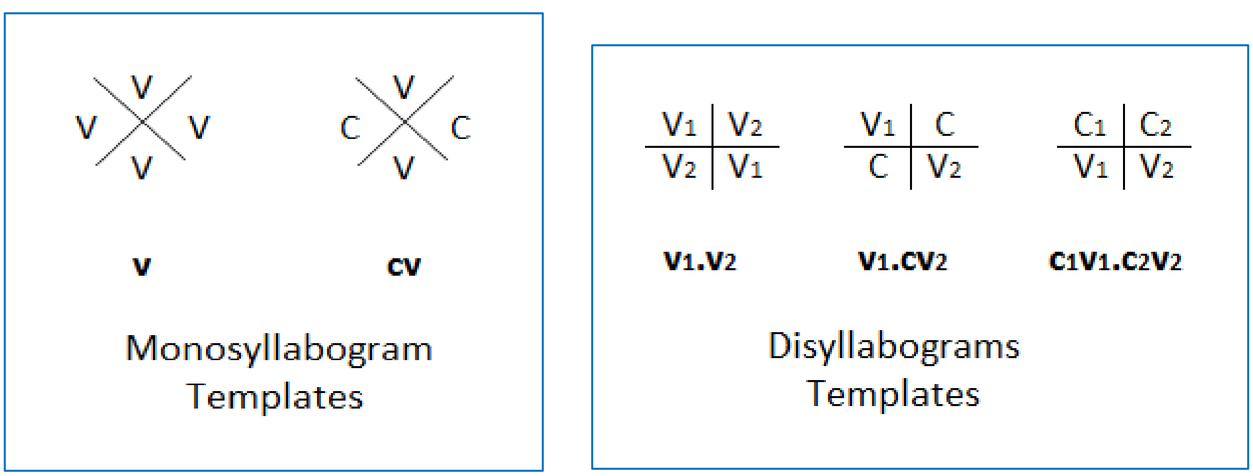


Diagram 5. The 5 Syllabogram Templates

Finally, here is an illustration on how the quadrant forms attach to a template:

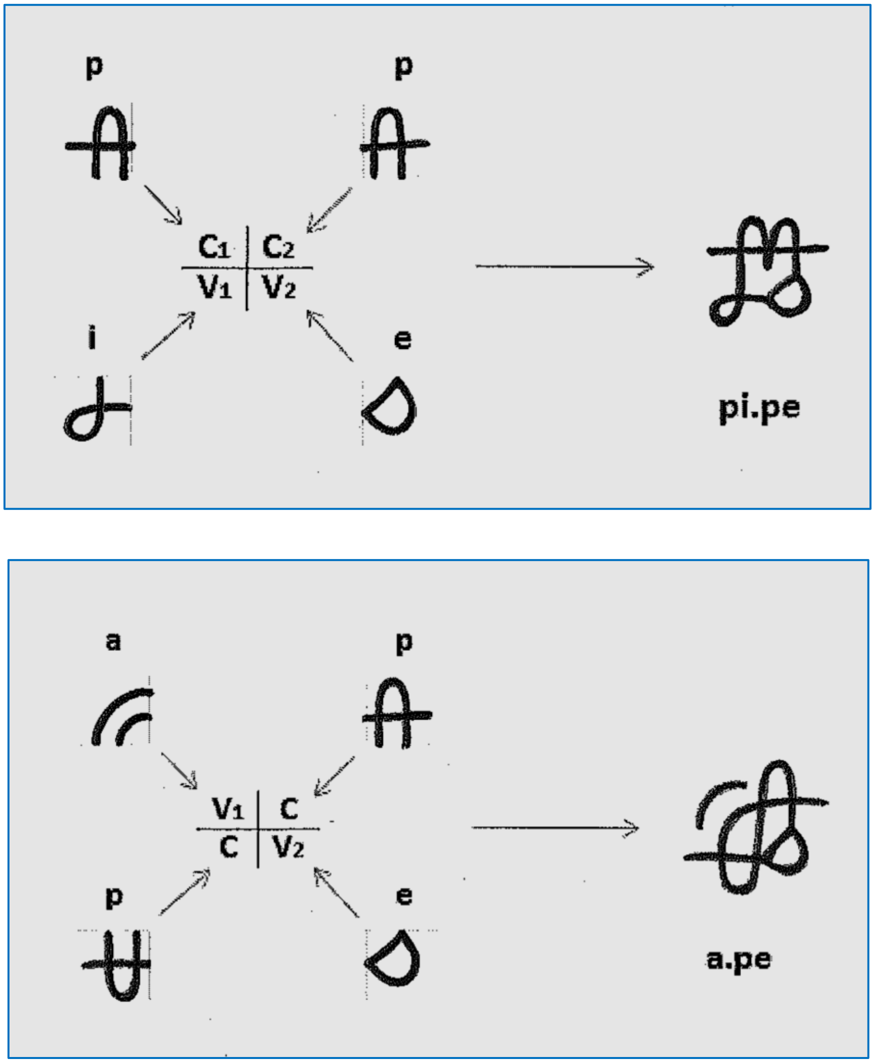


Diagram 6. How the quadrant forms bind

A couple of important points about these structures are warranted:

- Each quadrant form attaches to a spot in a template in a very particular way. When the same quadrant form is used in a different quadrant, it must be flipped across an axis so that critical symmetries are preserved. However, this process is very intuitive. For example, compare the p quadrant forms displayed in the disyllabograms for /pi.pe/ and /a.pe/ shown above.

- Syllabograms always consist of 4 filled quadrants. Quadrants frequently correspond directly to the 4 phonemes of the spoken disyllable. Nevertheless, even when there are not 4 phonemes being represented, no quadrant is ever left unoccupied. That is, even monosyllables (which consist of only 1 or 2 speech sounds) correspond to a composite figure containing 4 specific quadrant forms. The same is true for the disyllabograms that represent less than 4 phonemes (i.e, the v.v template and the cv.v/v.cv template). (In the example above, /a.pe/, this syllable combo contains a single 'p' sound though the completed written symbol has two quadrants that require being filled with the p quadrant form.)

<u>Disyllabogram Templates</u>:

(1) *The cv.cv template:* With the cv.cv disyllabogram template, the two consonants can be different (as in the disyllable /pato/) or they can be identical (as in the disyllable /papo/). The same is true for the 2 vowels (e.g, /pato/ versus /pata/). When this disyllabogram is oriented with the consonant forms on the top, the left side of the disyllabogram stands for the 1st syllable while the right side represents the 2nd syllable.

(2) *The v.cv template:* With the v.cv disyllabogram template, there is only one spoken consonant despite that there are still 4 quadrants. The same consonant quadrant form (corresponding to the consonant phoneme in the disyllable) is used in both of the consonant quadrants. When the disyllabogram is oriented so that the consonant form is in the top left hand corner facing up, this quadrant represents the consonant of the disyllable, and this is a cv.v syllable. (The 2nd consonant quadrant, though it must be occupied, signifies no consonant.) The mirror image of this is the v.cv syllable, as anticipated according to the rule of reflectional symmetry. (See more on this below.) As such, with this mirrored form, the upper right quadrant stands for the consonant phoneme.

(3) *The v.v template:* With the v.v disyllabogram template, the 4 quadrants correspond to the 2 different vowel phonemes. These two vowels* are treated as separate syllables, in accordance with current phonological analyses of Central Rotokas. The 1st vowel is represented in the top left and bottom right quadrants. The other two quadrants, across the opposing diagonal, are filled with the quadrant form for the 2nd vowel syllable.

> * NOTE: Long vowels (which consist of 2 of the same vowel within a single syllable) are treated differently. This too is based on modern analyses of Rotokas phonology.

<u>Monosyllabogram Templates</u>:

(4) *The cv template:* Monosyllabogram templates are oriented at a 45-degree angle to disyllabogram templates (for reasons that will become apparent when the rules of symmetry are discussed). With the cv monosyllabogram template, two of the quadrants (either the two aligned vertically or the two aligned horizontally) are occupied with the corresponding vowel quadrant form. The corresponding consonant quadrant form fills the other two quadrants. Note how the consonant quadrant forms attach slightly differently (i.e, connecting at their bases) to fulfill symmetry requirements. To see this, compare the quadrants for /p/ in the monosyllabogram for /pa/ below with the quadrants for /p/ from the previous examples of disyllabograms above.

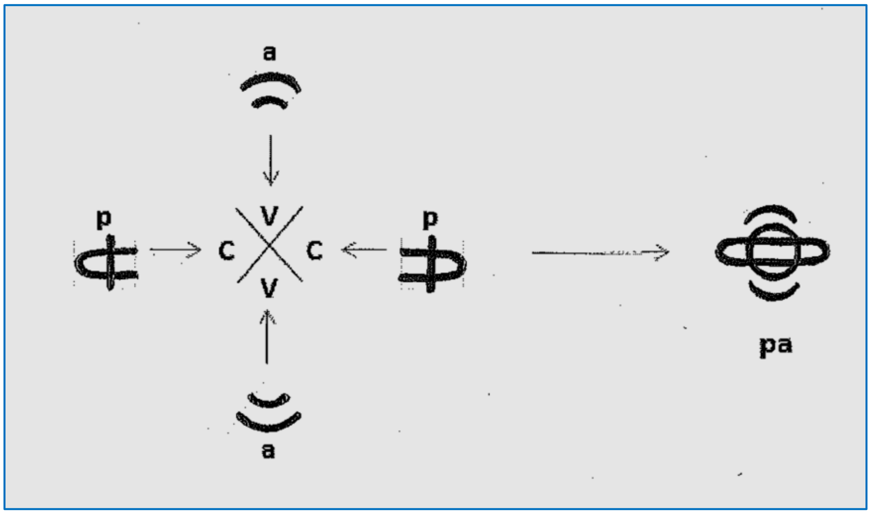


Diagram 7. Consonant forms bind in 2 ways

(5) *The v template:* With the v monosyllabogram template, all four quadrants are taken up by the matching vowel quadrant form. There are only 5 basic monosyllabograms, corresponding to the 5 short vowels /i, e, a, o, u/. (Additionally, there are 5 long vowel monosyllabograms, which are methodically related to these more basic short vowel forms. See below.)

2 Rules of Symmetry:

Visual similarities between related composite forms might not be immediately obvious to the untrained eye, since these constituent forms were designed to easily flow when combined together. This permits a writer of Rotokas using Uriovakiro to use a minimum of strokes, making writing more organic. The idea of built-in connections between component forms was originally inspired by something comparable that takes place with the conscript Funnish. Similarly, the fluid nature of these connections between Uriovakiro components parallels the system devised for The Knot Alphabet.

Whether such similarities are readily apparent or not, we've just discussed above how syllabograms containing the same phonemes will have identical quadrant forms. In addition to this, however, highly related combinations have similar properties. That is, Uriovakiro does not make use of unique shapes for all of the possible basic syllable combinations, which numbers over 1,200. (Note that this total becomes much, much larger if we consider long vowel combinations as well.) Rather, rotation and reflection play crucial roles in deriving interconnected representations from a single unique composite form. Potentially, for a given unique composite syllabogram, up to 8 associated disyllables can be derived from it! This is accomplished in two ways: by (1) generating the mirror image of the unique syllabogram, and/or (2) by turning one of these two syllabograms 90 degrees (up to 4 times). These symmetry relations are modelled after syllabaries like James Evans' syllabary for Cree, for which rotation of a syllabogram helps to generate vowel contrasts. With Uriovakiro, however, rotation and reflection are both utilized, and for different purposes. (See below.) This system of topographical associations drastically reduces the sum of symbols that would have to be learned. In particular, instead of over 1,200 basic syllabograms, there are less than 200 unique syllabograms. Just how these operations are used is a function of 2 underlying rules of symmetry, which apply to every syllabogram of the Uriovakiro system without exception.

1) <u>Reflection</u>: Generating the mirror image of any given disyllabogram about the vertical axis has the effect of swapping the 2 syllables of the disyllabogram.

2) Rotation: When a quadrant representing a consonant is rotated below the horizontal axis, this has the effect of voicing that consonant.

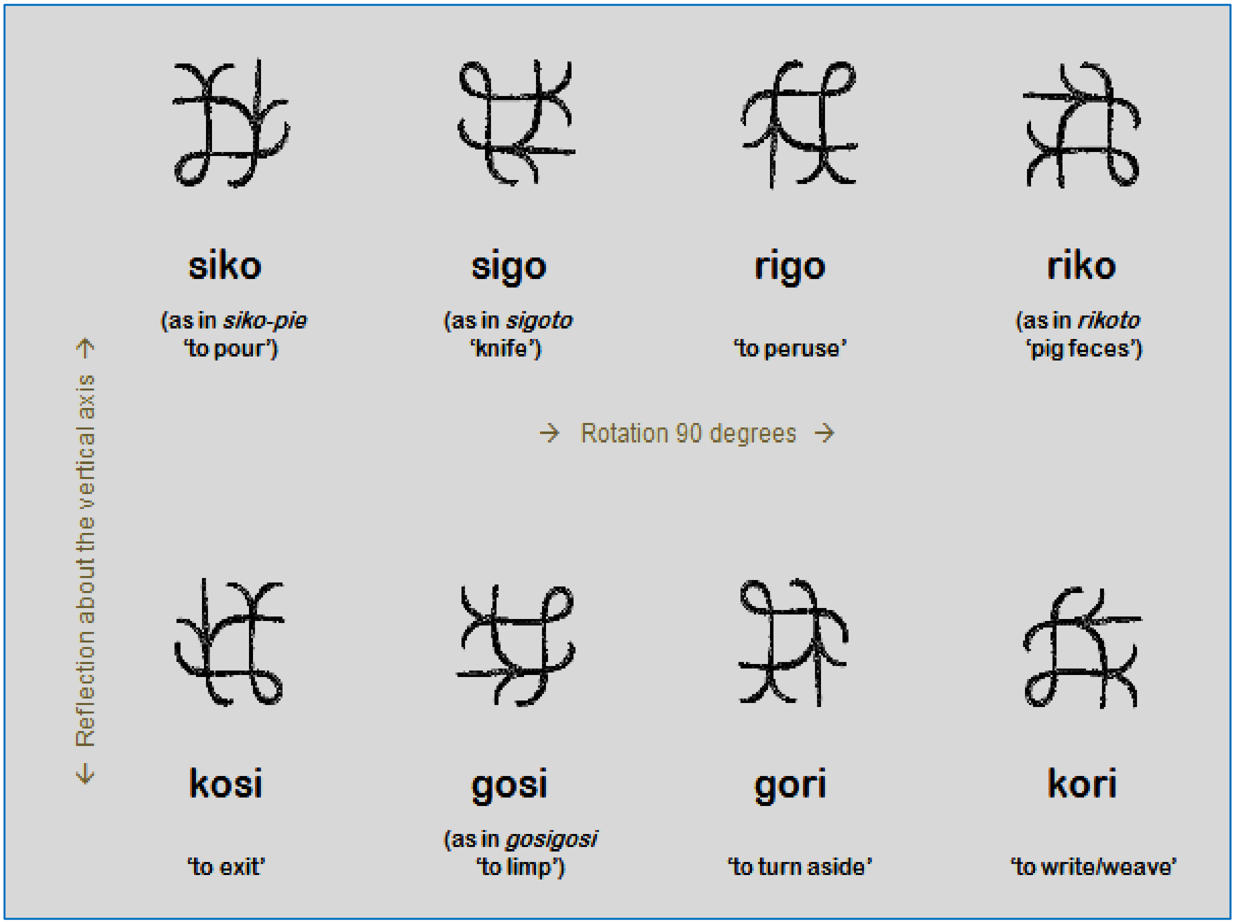


Diagram 8. 8 possible orientations for &-shapes

NOTE: For this system, only rotations of 90 degrees and reflections about the vertical axis are significant and productive. (For example, rotating 60 degrees is not a contrastive operation in Uriovakiro.)

6 Resultant Shape Types:

The 5 syllabogram templates were not created randomly; rather, the two rules of symmetry guided their design in order to result in particular shapes that met the desired symmetry requirements. The unanticipated result was 6 different classes of shapes. Each composite syllabogram can be categorized with respect to one of these classes. Knowing these shape types is not essential to learning the writing system; however, it may lend an appreciation of the extent of the role of symmetry for this system. Here are the 6 shape types, the total number of orientations per shape type, and associated properties:

Total # of Orientations:

- Hashtag Shapes (**#**): 1; Neither rotation nor reflection has any effect.
- Division Shapes (**÷**): 2; Reflection has no effect.
- Caret Shapes (**^**): 4; Reflection yields no forms not already produced via rotation.
- Percent Shapes (**%**): 2; Rotation yields no forms not already produced via reflection.

- Dollar Shapes (**$**): 4; Reflection yields 2 total forms which each can be rotated 1x.
- Ampersand Shapes (**&**): 8; Reflection yields total 2 forms which each can be rotated 3xs.

The name for each shape category arises from a more commonly recognized shape that shares the same properties. For example, for every form classified as a ^-shape,

1. it can be rotated 90 degrees four times to produce a different form, and,
2. it is symmetrical about the vertical axis for two of these orientations, just like the ^-symbol.

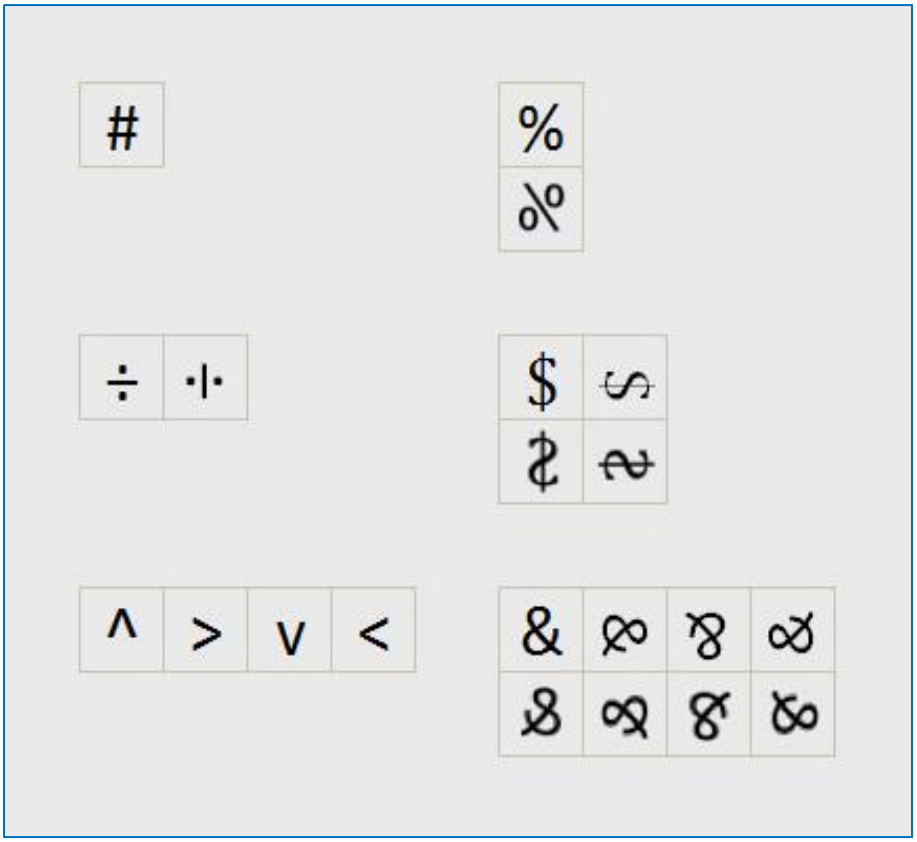


Diagram 9. The 6 Shape Types

In the above diagram, related forms are grouped together. Within these groupings, the horizontal direction displays each 90-degree rotation, when significant. Bordering vertically are new forms created by reflection about the vertical axis. If rotation or reflection produced a form that was already produced by the other operation, it was not duplicated.

How the templates relate to shape types / the effects of rotation and reflection:

The following diagram illustrates how the shape types correspond to the templates utilized to produce particular classes of syllabograms. Here, the implications of symmetry become apparent.

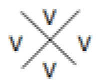
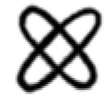
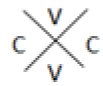
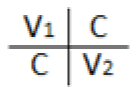
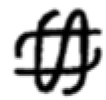
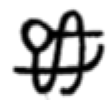
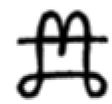
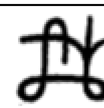
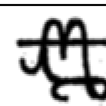
Template	Syllable(s)	Shape Type	Example	Syllabogram
	V	#	*o* 'her'	
	CV	÷	*pe* 'to let be'	
	$V_1.V_2$	%	*oe* 'sea sick'	
	$V_1.CV_1$	$\$$	*opo* 'to get taro'	
	$V_1.CV_2$	&	*epo* 'decorated'	
	$C_1V_1.C_1V_1$	^	*pipi* 'small'	
	$C_1V_1.C_2V_1$	&	*piki* 'bright'	
	$C_1V_1.C_1V_2$	&	*pupi* 'to sing with bamboo pipes'	
	$C_1V_1.C_2V_2$	&	*piku* 'to break off'	

Diagram 10. How the syllabograms correspond to shape types

The cv.cv template:
Because of how this template was (intentionally) configured, when the consonants and vowels are the same within the cv.cv template (e.g, with the disyllable /pi.pi/), the resultant composite form becomes symmetrical about the vertical axis. As such, reflecting the form about the vertical axis (which is tantamount to swapping the 2 syllables) has no effect, as expected. Since this set of forms possess the same symmetry properties as the ^-symbol, these are aptly termed Caret Shapes. (See above.)

When either consonant or either vowel (or both), are different, however, &-shapes are created. With these shapes, there are 8 possible orientations, corresponding to the 8 possible disyllable contrasts. The bulk of Uriovakiro forms are of this category.

The cv.v/v.cv template:
For this template, when the consonant quadrant form occupies the upper left quadrant, this characterizes the cv.v disyllabogram. (Recall that the other quadrant taken up by the identical consonant form represents no consonant.) Reflecting this form swaps the syllables, yielding the configuration for v.cv disyllables. Rotating the original cv.v form 90 degrees counterclockwise submerges the consonant form below the horizontal, producing the voiced consonant counterpart. Alternatively, with the mirrored v.cv form, rotation must be

clockwise to produce the voiced counterpart, since the quadrant representing the consonant is now on the right side.

When the vowel quadrants are different in this case, a new set of &-shapes results. This is unexpected: since there is only one consonant, there is only one voicing contrast, and so only 1 rotation is anticipated to be fruitful. Nonetheless, the other two representations seemingly produced by additional rotations are not distinct (generated independently) and happen to be related. In particular, continuing to rotate these forms swaps the vowels without relocating the consonant. (Note that this effect emerges inadvertently and is not a productive process, e.g, across templates.)

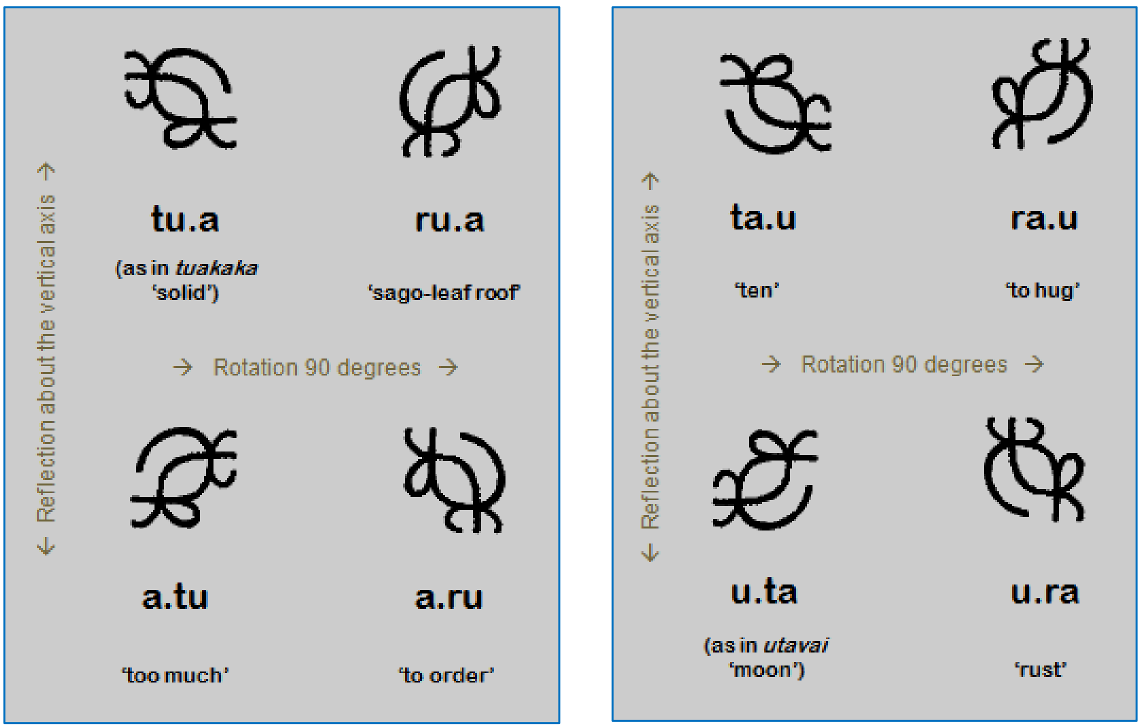


Diagram 11. The 8 variants of a cv.v syllabogram

When the vowel quadrants are identical (as with the disyllable /o.po/), a $-shape occurs. The symmetries associated with the $-symbol become apparent here: rotation produces only a single variant. This variant corresponds to the (de)voicing of the solitary consonant. The reflection of this is indeed intelligible (in this case, /po.o/) though not currently utilized. (Note that long vowels are handled as a single syllable (e.g, /poo/) and are therefore not relevant to this template.)

The v.v template:
Syllabograms formed from the v.v template are always %-shapes. The mirror image of a v.v syllabogram displays the vowels swapped accordingly. On the other hand, rotation of such shapes produces no new forms, i.e, distinct from the one gained via reflection. This is as expected, since v.v disyllables contain no consonant phonemes which require (de)voicing.

The cv template:
Shapes made with this template are ÷-shapes, which have exactly 2 distinct orientations. Because monosyllables are comprised of only one syllable by definition, swapping syllables should not make any sense for this template. As such, reflection of such forms has no effect. Rotation, however, is relevant for this particular type of monosyllable, since there is a consonant that exhibits a voicing contrast. When the form is

rotated such that the consonant quadrants are aligned horizontally, neither consonant quadrant is submerged below the horizontal. Therefore, this orientation signifies the cv syllable containing an unvoiced consonant. When the consonant quadrants are aligned vertically, however, at least one of the consonant quadrants is fully below the horizontal. This orientation signals that the consonant is voiced.

The v template:
The 5 short vowel monosyllabograms (plus 5 long vowel monosyllabograms) made with this template comprise all the #-shapes. This set of shapes has maximal symmetry in this paradigm. Like with the cv template, reflection has no effect, as anticipated, since there is no duo of syllables to be interchanged. Similarly, rotation has no effect, since there are no consonants that require a voicing contrast.

<u>The 195 Basic Syllabograms:</u>

Sampling from the 8 basic quadrant forms (that is, without the 5 long vowel quadrant forms), if we employ the 5 possible syllabogram templates, we arrive at just under 200 possible unique syllabograms.

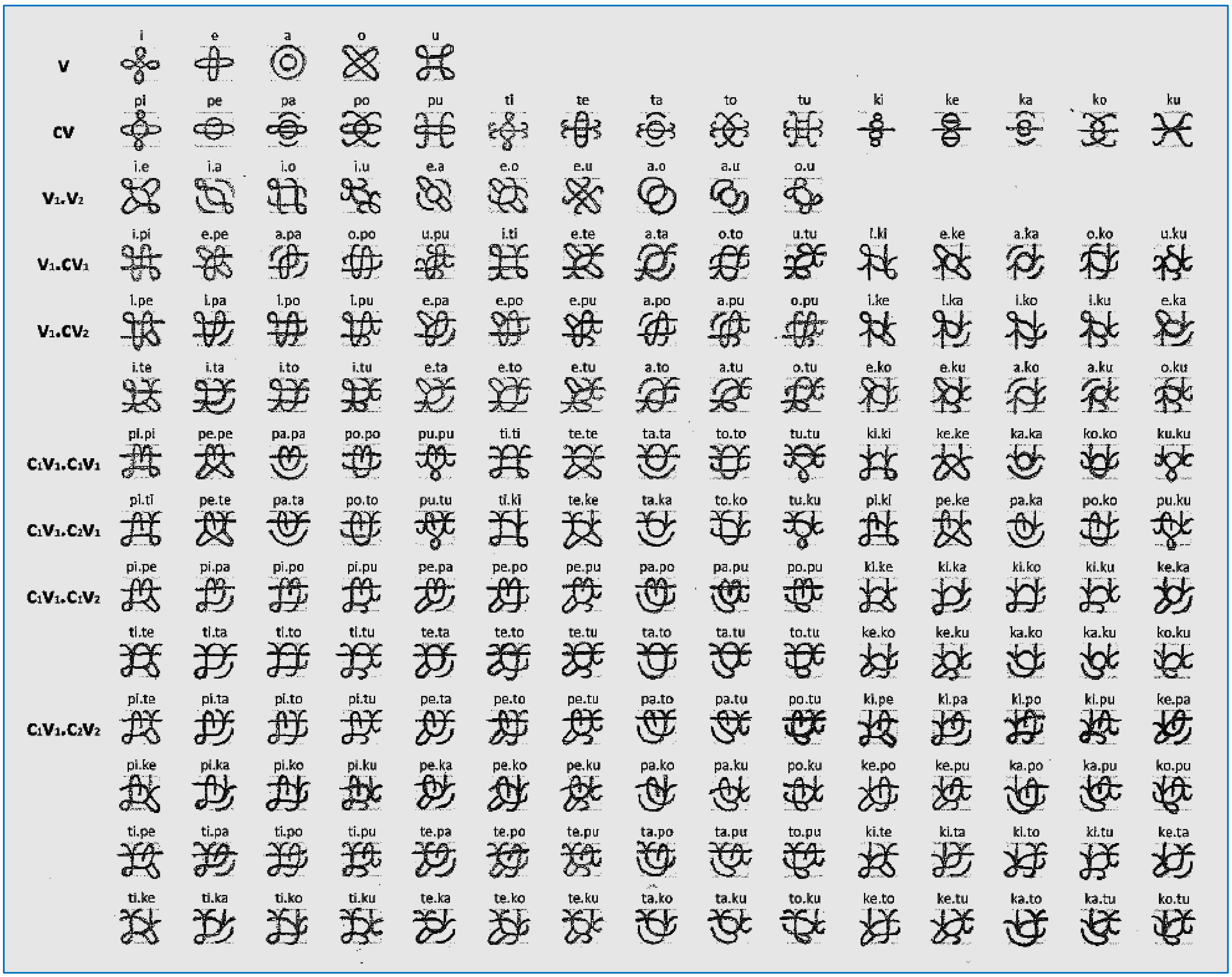


Diagram 12. The 195 Basic Syllabograms

Recall that each of these unique forms can represent up 8 disyllable combinations, which result from the operations of reflection and/or rotation. These operations lead us to over 1,200 possible symbols, though only the unique ones are illustrated here. Also, note that many more syllabograms would be yielded if we were to additionally consider the 5 long vowel quadrant forms.

Three Traits of Writing Systems:

Traditionally, writing systems are sometimes classified according to 3 pairs of distinctions:

- Analytic / Pure versus Synthetic / Impure / Systematic, where:
  Analytic / Pure = graphic similarities between symbols do not correspond to phonic similarities;

- Motivated versus Arbitrary, where:
  Motivated = a natural relationship between the graphs of a writing system and what they correspond to.

    - For semantic scripts, this equates to a symbol having some resemblance to its non-verbal referent.
    - For phonetic scripts, like (poly)syllabaries, this can mean that a symbol depicts, for example, how the mouth is shaped when the sound is produced.

- Complete versus Incomplete, where:
  Complete = the "extent to which a script provides representations for the whole range of units of the relevant level in the language" (Sampson 1985);

    - For a syllabary, this would mean that each possible spoken syllable would correspond to its own representation without requiring additional arbitrary rules for orthography. Examples of language-specific orthographic rules include:
        - **implicit codas** (C1V => /C1VC2/),
        - **silent vowels** (C1V1 + C2V2 => /C1V1C2/), or,
        - **echo vowels** (C1V1 + C2V1 => /C1V1C2/).

In an analogous fashion, these distinctions could be applied to Uriovakiro (and polysyllabaries, in general):

1) Uriovakiro is **synthetic**.

   Uriovakiro does not have separate arbitrary symbols for the full range of over 1,200 possible syllables combinations. Rather, a form that represents a particular disyllable is systematically related to other forms representing associated disyllables. (For example, the Uriovakiro disyllabograms for /paku/ and /pito/ are formally related since both disyllables (1) begin with a labial stop, and (2) contain 2 unvoiced consonants.) Moreover, any given unique form can represent up to 8 different disyllables, depending upon how that written form is rotated and reflected. In general, 8 basic quadrant forms (plus 5 double vowel quadrant forms) combining into 5 syllabogram templates results in about 200 unique composite syllabograms. From these composite forms (which correspond to 6 types of syllabogram shapes), the 2 simple rules for symmetry yield the total 1,200 possible syllable combinations. (See above.) That disyllabograms are compositional means that they can be decoded into their spoken segments. While this might make Uriovakiro an impure polysyllabary, a purer system would be much more simplistic, less coherent, and, arguably, less interesting.

2) Uriovakiro is somewhat **motivated**.

Since there are only 8 basic quadrant forms (plus 5 long vowel quadrant forms), they are readily memorized. Nonetheless, there are some aspects of the forms that make them more memorable. When certain composite symbols are contrasted, some motivation for particular component forms becomes apparent. First consider three cv monosyllable forms:

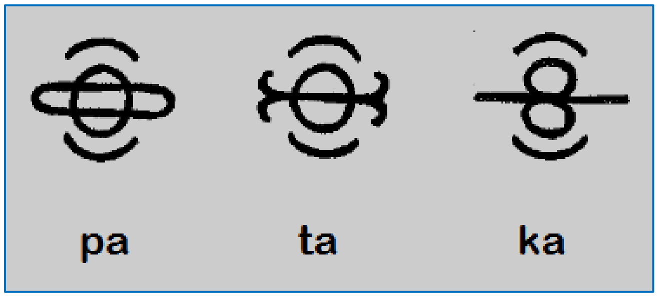


Diagram 13. Some Motivation: 'pa' versus 'ta' versus 'ka'

If you imagine the central area symbolizes the oral cavity, you'll first notice that this is where the vowel occurs, both actually and symbolically. Now, contrast the consonant forms themselves. First, with the p-form, you'll see that consonant closure occurs well outside the mouth (representing bilabial closing) while there is no closure within the central space. On the other hand, the t-form and k-form have closures farther within the mouth, i.e, with the tongue. The t-form closes just inside the lips; the k-form closes farther inside.

With the vowels' forms, less motivation is apparent, although these shapes are still systematically arranged. In general, the vowel monosyllabograms were loosely based upon the cymatic patterns that Sanskrit or Hebrew vowel shapes are sometimes imagined to be modelled after. Looking at the vowel monosyllabograms, you can see some clear patterns:

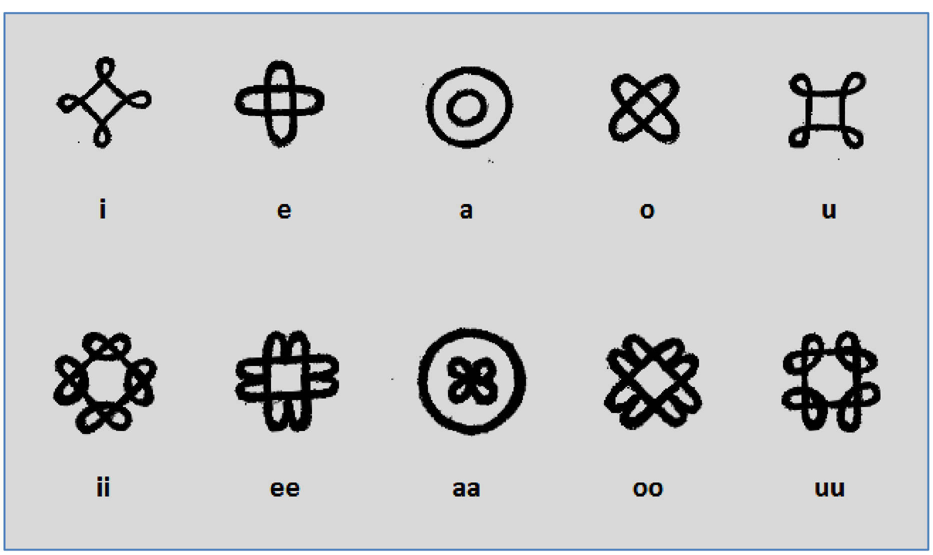


Diagram 14. Basic Vowel Monosyllabograms and Long Vowel Monosyllabograms

- The most open vowel /a/, which is also a central vowel, is embodied by the most open, centralized shape. By contrast, syllabograms for the close vowels /i/ and /u/ consist of shapes whose curves are the most tightly closed. The forms for the mid vowels /e/ and /o/ fall right in between.
- The syllabograms for the front vowels /i/ and /e/ share an orientation: the bumps or loops are aligned vertically and horizontally. The back vowels /u/ and /o/ correspond to their front vowel counterparts but rotated 45 degrees. The single central vowel /a/ has no counterpart and so is invariant with rotation.
- Long vowel forms are fashioned from their short vowel counterparts and can be viewed as a systematic modification to these forms. Beginning with the corresponding short vowel quadrant, an unseen line divides the quadrant into two, symbolizing the doubling of the form. From the composites, quadrant forms can easily be obtained by slicing up these composites according to the relevant template.

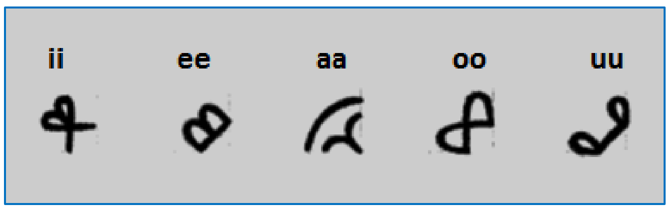


Diagram 15. Long Vowel Quadrants

3) <u>Uriovakiro is **complete**</u>.

Uriovakiro has a symbol corresponding to every possible Rotokas two-syllable combination. As such, this writing system is maximally complete and therefore does not require any arbitrary orthographic rules. Even long vowels can be represented through the use of the 5 different optional quadrant forms. While long vowels are contrastive in speech, it has been noted that Rotokas natives do not commonly distinguish between long and short vowels orthographically (Robinson 2011). This is the case in spite of the fact that a convention to do so does exist with their standard writing system using the Latin alphabet. (In particular, as expected, the underutilized convention consists of writing long vowels as two segments.) Thus, from a native's perspective, long vowel quadrants might not be strictly essential in Uriovakiro either. Nonetheless, the inclusion of such a convention for Uriovakiro was done in the interest of a more complete writing system.

For words containing an odd number of syllables (or when morpheme boundaries affect the parsing of a word into (di)syllable combinations), monosyllables must be accounted for. The Uriovakiro solution to this is the inclusion of separate distinct templates for monosyllables: the two monosyllabogram templates. This could have been accomplished in a different fashion, however. Another, less complete polysyllabary might have employed analogues to the arbitrary orthographic rules used for syllabaries (that is, implicit codas, silent vowels, and/or echo vowels). In particular, we could imagine an incomplete disyllabary taking care of monosyllables by utilizing orthographic rules for:

- **implicit syllables** (S1S2 => /S1S2 S3/),
- **silent syllables** (S1S2 + S3S4 => /S1S2 S3/), or,
- **echo syllables** (S1S2 + S3S2 => /S1S2 S3/).

For Uriovakiro, however, including separate templates for monosyllables was done again in the interest of a more complete writing system. Furthermore, it permitted the exploration of additional interesting shape combinations.

<u>A final caveat</u>:

There are several aspects of polysyllabaries that do not make them the most realistic of writing systems. For one thing, for a polysyllabary to be at all practical, the spoken language being represented must have an extremely simple syllable structure and an inventory containing very few phonemes. If there are relatively numerous phonemes or if the syllable structure is even slightly more complex, this greatly increases the amount of possible disyllables (and, hence, disyllabograms required to represent the language). Even Central Rotokas, with its small collection of speech sounds and its maximally simple syllable structure, has over a thousand possible disyllables to be captured by the writing system. (And this number jumps up even higher if long vowel combinations are added into the mix.) Uriovakiro takes advantage of different symmetries to reduce the number of unique symbols. Nevertheless, this might not be possible, or desirable, for a polysyllabary in general. Even so, an alphabet or syllabary might serve the same goals more efficiently. In fact, the Latin alphabet has been doing so nicely for Rotokas for decades. An additional obstacle is the general issue of representing words with an odd number of syllables. This is a problem that any proposed polysyllabary should be prepared to solve. Uriovakiro addresses this issue by additionally employing monosyllabograms. However, the sheer existence of monosyllabograms seems to preclude the inevitability, or sheer necessity, of disyllabograms at all! For these reasons, a polysyllabary is probably not a feasible writing system for the majority of the world's natural languages. Nevertheless, it is hoped that the creation of Uriovakiro has been thought-provoking; at the very least, it has helped us in considering how we might extend the classification of phonetic writing systems.

Writing Sample:

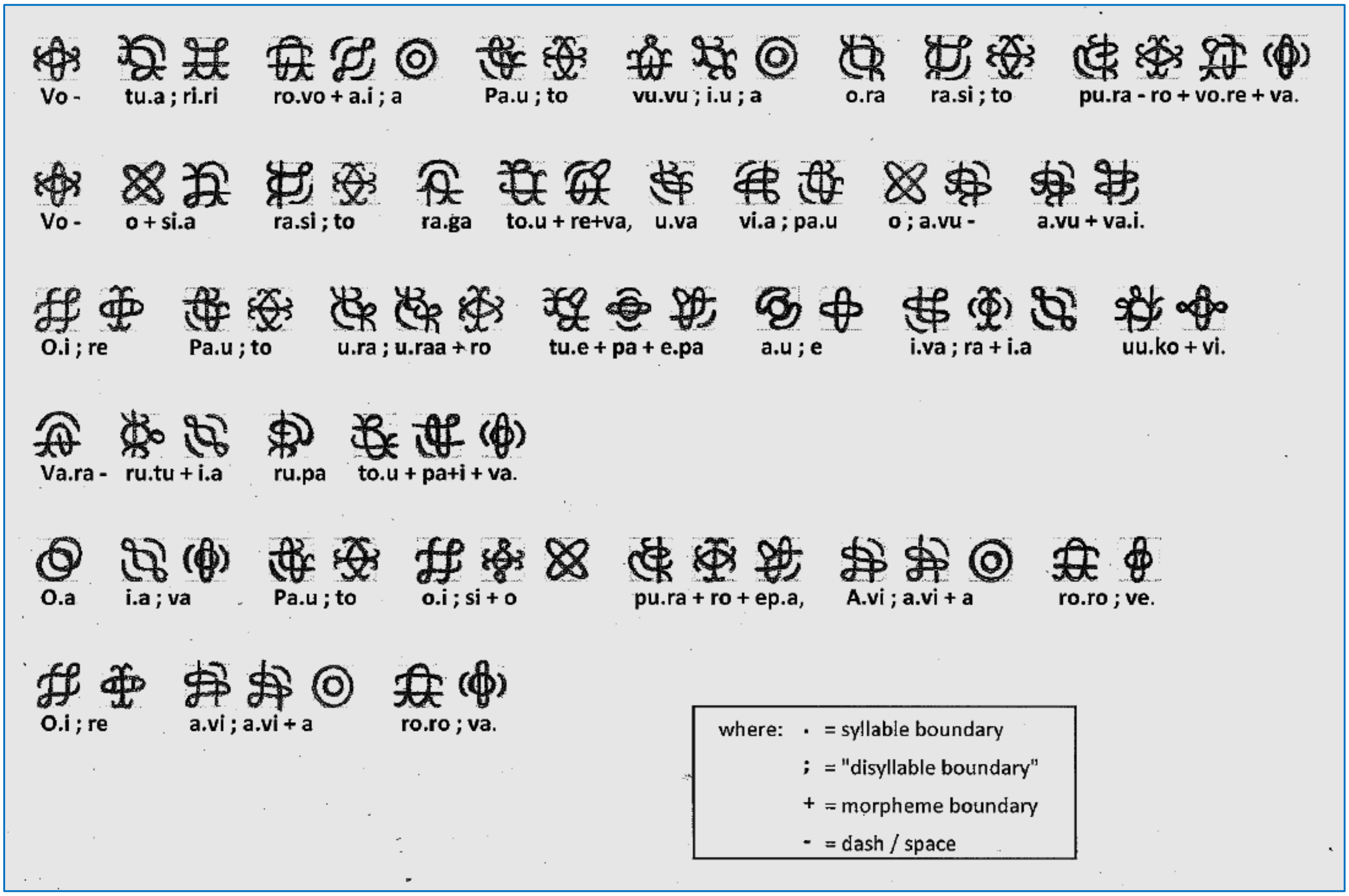


Diagram 16. Sample Text in Central Rotokas using Uriovakiro

English Translation

In the beginning, God created heaven and earth.
The earth was formless and empty,
The spirit of God was hovering over the water
and darkness covered the deep water.
Then God said, "Let there be light!"
So there was light.