

Analyzing the Representation of a Universal  
Language in Neal Stephenson's *Snow Crash*  
and Max Barry's *Lexicon*

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## 1 Introduction

The idea of a universal human language stems from origin tales where a common language is replaced by many divergent ones. One of the most prominent in western society comes from the Bible, where in Genesis 11:1-9, God punishes and prevents the people trying to build a tower to heaven, the Tower of Babel, by splitting their language so that it was mutually unintelligible. The King James translation is as follows:

6 And the Lord said, “Indeed the people are one and they all have one language, and this is what they begin to do; now nothing that they propose to do will be withheld from them.

7 Come, let Us go down and there confuse their language, that they may not understand one another’s speech.”

The recording of this event and others from different cultures gave rise to the theory of *monogenesis*, which Ruhlen defines as “the theory that all modern languages have evolved from a single earlier language... In one sense, monogenesis is taken to mean that... all languages that now exist (or have ever existed) are (or were) altered later forms of this original language” (Ruhlen 3). This original language would have been the Pre-Babel language, and logically leads to a modern universal language being either this Pre-Babel language or some descendent of that.

This concept and the rediscovery of this Pre-Babel universal became a reason for interest in constructed languages during the seventeenth century (Cheyne 387). In the present day, it continues to be explored in modern science fiction, in particular the novels *Snow Crash* by Neal Stephenson and *Lexicon* by Max Barry.

In *Snow Crash*, the plot is driven by the assertion that the ancient Sumerian language is this original pre-Babel language. The premise is “that Babel was an actual historical event. That it happened in a particular time and place, coinciding with the disappearance of the Sumerian language. That prior to Babel/Infocalypse, languages tended to converge. And that afterward, languages have always had an innate tendency to diverge” (Stephenson 208). The novel includes various instances where characters speak in ‘Sumerian,’ referenced to in the book and this paper as ‘babble,’ represented by utterances made up of syllables strung together. These utterances are examined in this study.

*Lexicon*’s plot is also influenced by the story of the Tower of Babel and is driven by the idea that all people can be psychologically segmented into one of 228 segments. Based on these, there are certain corresponding words, referred to in this paper as ‘attention words,’ that compromise the brain into a state of susceptibility. These words are segment-specific universally ‘understood.’ In other words, any person of a certain psychological type is susceptible to a specific set of words. These words are “words that were crafted decades ago and have been strengthened ever since” (Barry 88), universal descendants of ancient words in an ancient language. The novel includes various examples of strings of these that are examined in this study.

The objective of this study is to analyze and assess the success of both authors’ portrayal of a universally understood language by evaluating the samples in terms of linguistic universals. This study is based on the argument that if the texts are meant to represent a universal language, then linguistic universals should be present to validate that representation. Because only written

phonetic representations are available, without discernable grammar or syntax structures, phonetics of these two texts will be examined in regards to the phonetic inventories of both text samples as well as linguistic implicational hierarchies.

## **2 Methodology**

This section of the study is broken up into two parts: the materials used and the procedure followed.

### **2.1 Materials**

In this study, the materials came first before deciding on what and how to analyze between the two. Both works, *Snow Crash* and *Lexicon*, are written by prominent science fiction authors and were encountered before this study. During past readings, a common theme was noticed with the Tower of Babel story and the splitting of languages from a single language. This concept became the basis for this study.

After obtaining copies of each novel, both texts were scanned over in their entirety to pick out instances of phonetic representation of a universal language. These were compiled into this study's data sets.

### **2.2 Procedure**

Before approaching the data for this study for examination, articles and resources were compiled utilizing professor office hours and many web searches to turn up general information on the subjects relevant to the study: linguistic universals and background information on the concept of a universal itself necessary to approach this study initially knowing what to look for in the text.

Data was collected from each novel by picking out each occurrence where each language was spoken. These were compiled into charts on a Microsoft Word document, noting order they occurred with an assigned utterance number as well as page number. A printout was made in order to annotate for features. A rough outline of features to examine was drawn up utilizing a PowerPoint lecture by Dr. Littlefield at Northeastern University as well as multiple journal articles found through the online database JSTOR. These were then searched for in each text, quantized, and formatted into charts, Figures 3.1.1 to 4.4.2.

## **3 Results**

In this section, data from each novel representing linguistic universal features from the results of examining the literature is presented from the areas of linguistic inventories, implicational universals, and universal syllable structures.

### **3.1 Inclusion of Consonant Inventory**

There are specific consonants that are present in nearly all languages, shown in the table below (Littlefield 3). This feature of languages was chosen to be examined because it was determined that the presence of these consonants in a language would indicate whether each representation could be seen as a viable universal language, a language that would be expected to include this inventory. SAE phoneticization/pronunciation in the text are assumed in this study, given that the novels are both written in English and thus have a primarily English-speaking audience.

Most Common Consonants

Oral Stops	/t/, /k/, /p/
Nasal Stops	/n/, /m/
Fricatives	/s/, /f/
Liquids	/l/
Approximants	/w/

### 3.1.1 Oral Stops /t/, /k/, and /p/

In *Snow Crash*, the babble was found to contain all of the most common oral stops. In example, utterance 5 in Figure 1 is shown below:

“ba la zin **ka** nu **pa** ra ta”

Here, all three of the common oral stops are represented. The usage of [k] was most common, with Figure 3.1.1 showing a total of 5 instances over the 6 sample utterances for a ratio of 83.3%. Both other oral stops were represented as well, both showing up twice over the 6 utterances for ratios of 33.3%. Total, this accounts for the most common oral stops being represented 9 times over the 6 utterances for a ratio of 150.0%.

In *Lexicon*, the attention word samples were only found to contain the oral stops [k] and [t], with [p] not present. An example of their usage is utterance 11 from Figure 2:

“**K**innal forset hallassin aidel”

Here, two of the common oral stops are represented. The two used were used widely in the utterances, with [t] being represented the most. Figure 3.1.2 shows 17 instances of [t] over 11 utterances for a ratio of 154.5%. [k] was also represented frequently, with 14 instances over 11 utterances for a ratio of 127.3%. The absence of [p] gives a contributing ratio of 0.0%. Total, this amounts to oral stops being extremely present in the text, save for [p], with Figure 3.1.2 showing the overall ratio of 281.8%.

### 3.1.2 Nasal Stops /n/ and /m/

In *Snow Crash*, the babble was found to contain both of the most common nasal stops in language. In example, the beginning syllables of utterance 1 from Figure 1 is shown below:

“e **ne em ma ni** a gi a gi **ni mu**...”

Here, both of the common nasal stops are represented at the beginnings and ends of syllables. [m] was most common in *Snow Crash*, occurring in 35 instances over the 6 utterances for a ratio of 583.3%. The other nasal stop [n] was nearly as prominent, with 33 instances over 6

utterances for another high ratio of 585.3%. Together, they total a ratio of over 1000%, with 68 instances over 6 utterances for the overall ratio of 1133.3%.

In *Lexicon*, the attention word samples were also found to contain both of the most common nasal stops. An example of their usage is utterance 1 from Figure 2:

“Coarg **medicity nigh**ten comense”

In this novel, both nasal stops occurred fairly frequently, with [n] appearing the most, with 19 instances over 11 utterances for a ratio of 172.7%. The nasal stop [m] was present in 8 instances over 11 utterances for a ratio of 72.7%. Total, their ratio comes out to be 245.5% with 27 instances over the 11 utterances.

### 3.1.3 Fricatives /s/ and /f/

In *Snow Crash*, the common fricative [f] was not present in any of the utterances, with only [s] represented. An example containing [s] is below, a part of utterance 3 of Figure 1:

“...en nu ge en us sa tur ra lu ra...”

As [f] was not present, this accounts for 0.0% of the text. The fricative [s] occurred twice in the 6 utterances, for a ratio of 33.3%, that number also being the total ratio of the language-common fricatives in *Snow Crash*.

Both of the common fricatives [s] and [f] were represented in the attention words in *Lexicon*. An example comes from utterance 9 of Figure 2:

“Ventrice hasfal collimsin manning”

In *Lexicon*, both appeared fairly frequently. The fricative [s] appeared more often, with 13 instances shown over 11 utterances for a ratio of 118.2%. [f]’s appearance had a ratio of 45.5% with 5 instances over the 11 utterances. Together, they contribute to an overall ratio of 164.6%, with 18 total instances over 11 utterances.

### 3.1.4 Liquid /l/

There is one linguistically common liquid [l], and it is present in the babble in *Snow Crash*. An example is shown from the beginning of utterance 6 in Figure 1:

“me lu lu mu al nu urn me en ki me...”

As shown in Figure 3.4.1, this [l] was present in 15 instances over the 6 utterances for a total ratio of 250.0%.

The [l] is also present in the attention words from *Lexicon*. An example from this text is shown in utterance 11 of Figure 2 below:

“Kinnal forset hallassin aidel”

These were prevalent in the text, with Figure 3.4.2 showing 12 instances over 11 utterances for a total ratio of 109.1%.

### 3.1.5 Approximant /w/

The approximant [w] is not represented at all in the babble in *Snow Crash*. In *Lexicon*, it is represented once, in utterance 5 of Figure 2, shown below:

“Vartix velkor mannik **w**issick”

This one inclusion shown in Figure 3.5.2 of [w] in the 11 attention word utterances accounts for a ratio of 9.1%, a relatively low representation.

## 3.2 Accuracy of Implicational Universals

In linguistic implication universals, the theory, as explained by Professor John Hawkins of the University of Southern California, is that “if a language has some property (or properties) P, then it will also have some property (or properties) Q. These ‘if P then Q’ statements require that a language must not have property P without property Q” (Hawkins 193). This concept will be shown in charts included in the sections below.

These implicational rules were chosen to be examined in context with the two texts as another test. If the languages written in *Snow Crash* and *Lexicon* can be considered valid languages and maintain their representations of a universal language, they should follow these implicational universals.

### 3.2.1 Voicing of Obstruents

If a language includes voiced obstruents, it must also include voiceless obstruents. However, a language that includes voiceless obstruents does not necessarily have to include the voiced counterparts. This can be represented in the chart below from Littlefield:

	Voiceless Obstruents	Voiced Obstruents
possible	+	+
possible	+	–
impossible	–	+

In the following sections, the pairs of voiced/voiceless obstruents [d]/[t] and [b]/[p] will be examined in both *Snow Crash* and *Lexicon*.

#### 3.2.1.1 Voicing of Obstruents - [d]/[t] pair

In *Snow Crash*, the babble includes both the voiced obstruent [d] and the voiceless obstruent [t]. Examples for both are shown below, from utterance 3 and 6, respectively from Figure 1:

“...ge en us sa tur ra lu ra...”

“...al nu um me **dug** ga mu me...”

As shown in Figure 4.1.1, the voiced [d] showed up once in the 6 utterances for a ratio of 16.6%. The voiceless [t] was only slightly more common, with 2 instances over 6 utterances for a ratio of 33.3%. The total ratio of both is 3 instances over 6 utterances for a combined ratio of 50.0%.

In *Lexicon*, the attention word excerpts also include both the voiced obstruent [d] and the voiceless obstruent [t]. An example is utterance 11 from Figure 2:

“Kinnal forset hallassin **aidel**”

Here, Figure 4.1.2 shows that the voiced obstruent [d] showed up in 5 instances over 11 utterances for a ratio of 45.5%. The voiceless obstruent [t] was even more common, with 17 instances over 11 lies for a ratio of 154.5%. Total, they add up to 22 instances over 11 utterances for a total ratio of 200.0%.

### 3.2.1.2 Voicing of Obstruents - [b]/[p] pair

In *Snow Crash*, the babble includes both the voiced obstruent [b] and the voiceless obstruent [p]. Examples for both are show below, from utterance 5 of Figure 1:

“**ba** la zin ka nu **pa** ra ta”

Consistent with the implicational hierarchy, the inclusion of the voiced [b] induces the inclusion of the voiceless obstruent [p] as well. The *Snow Crash* babble is shown in Figure 4.2.1 to have 4 instances of [b] over 6 utterances for a ration of 66.6% as well as 2 instances of [p] over the 6 utterances for a ratio of 33.3%. Together, they account for a ratio of 100.0%.

In *Lexicon*, the voiced [b] is present once in the sample. This is shown below in utterance 10 of Figure 2:

“Vecto **brillia** masog vat”

This one occurrence accounts for a ratio of 9.1%. However, although [b] is included in the sample, the voiceless obstruent [p] is absent in the attention words from *Lexicon*, inconsistent with the implicational universal rule.

### 3.2.2 Nasals

If a language includes the velar nasal [ŋ], it must also include the bilabial nasal [m] as well as the dental/alveolar nasal [n]. However, a language that includes the bilabial nasal does not necessarily have to include the velar nasal. Last in the hierarchy, the presence of the dental/alveolar nasal does not necessitate the presence of either the velar nasal or the bilabial nasal. This can be represented in the chart below, adapted from again from Littlefield:

	[n]	[m]	[ŋ]
--	-----	-----	-----

possible	+	+	+
possible	+	+	-
possible	+	-	-
impossible	-	+	+
impossible	-	+	-
impossible	-	-	+

As found in Figures 3.2.1 and 3.2.2 in the search for the presence of common nasal stops in each text, both nasals [n] and [m] were found in the babble of *Snow Crash* and the attention word strings from *Lexicon*. This is consistent with the implicational hierarchy of nasals in languages. here, the presence of the velar nasal [ŋ] was searched for to complete this hierarchy.

In the *Snow Crash* babble, the [ŋ] is not present at all, contributing a 0.0% ratio and keeping the overall ratio of nasals present to utterances at 1133.3%. This is still consistent with the implicational hierarchy, though, as the presence of the bilabial nasal and the dental/alveolar nasal do not necessitate the presence of the velar [ŋ].

In the *Lexicon* attention words, [ŋ] is found once. This is shown below in utterance 9 of Figure 2:

“Ventrice hasfal collimsin **mannig**”

This one instance over the 11 total utterances contributes a ratio of 9.1%, increasing the total ratio of instances of nasals present to total utterances to 25.5%. This is consistent with the first row of the implicational hierarchies chart, with all three levels present.

### 3.2.3 Affricates

If a language includes affricates, it must also include fricatives as well as stops. However, a language that includes fricatives does not necessarily have to include affricates. Last in the hierarchy, the presence of stops does not necessitate the presence of either fricatives or affricates. This can be represented in the chart below, adapted from Littefield:

	Stops	Fricatives	Affricates
possible	+	+	+
possible	+	+	-
possible	+	-	-
impossible	-	+	+



impossible	–	+	–
impossible	–	–	+

As found in an earlier presentation of the consonant inventories of both text samples (see Figures 3.1.1–3.5.2), both the *Snow Crash* babble and *Lexicon* attention word strings contain both stops (such as [t] and [k]) and fricatives (such as [s] and [f]), consistent with the hierarchy above. In Figures 4.4.1 and 4.4.2, data the representation of affricates is shown. The representation of two common affricates, [tʃ] and [dʒ] are examined.

In *Snow Crash*, no representation of these affricates are shown in the babble utterances. This is consistent with the hierarchy above.

In *Lexicon*, there is no representation of the affricate [tʃ], but one of the affricate [dʒ]. This is shown phonetically below in utterance 3 of Figure 2:

“JUSTITRACT. MEGRANCE. VARTIX.”

This was the only instance found in the 11 utterances, and thus composes the total ratio of affricates in the *Lexicon* attention word utterances of 9.1%.

### 3.3 Presence of Uncommon Phonemes

In order to identify phonemes that are uncommon in language, the study “A Statistical Study of Consonants in New World Languages II: Data” published in the *International Journal of American Linguistics* was consulted. In this study, 176 languages were categorized into 3 types based on the number of series of stops present in the language (Pierce 94). Pulled from the data set, the three uncommon phonemes to be examined here (selected arbitrarily from the phonemes characterized as appearing in less than half of the languages) are: the interdental fricative [θ], the labiodental fricative [θ], and the velar nasal [ŋ].

These were examined to see if they are present in either of the languages in each text. As uncommon phonemes, they would not be expected to show up in text representative of the universal language concept, a language that supposedly precipitated all other languages. Their presence would indicate inconsistency with that logic.

Figures 5.1 and 5.2 show the data representative of the inclusion of these phonemes in both texts.

In *Snow Crash*, none of these phonemes were used for a clear ratio of 0%.

In *Lexicon*, however, two of the three phonemes were present in the text, an example being the inclusion of [v], shown in utterance 5 from Figure 2:

“Vartix velkor mannik wissick”

This [v] was found 9 times in the 11 utterances for a ratio of 81.8%. The other uncommon phoneme found was the velar nasal [ŋ], appearing once in 11 utterances for a ratio of 9.1%. These two totalled came to an overall ratio of 90.9%.

### 3.4 Syllable Structure

The one syllable structure that appears universally in languages is the CV syllable. Cairns and Feinstein write that “the existence of other syllable types in a language almost always implies the existence of CV syllables... languages with only one syllable type (almost) always exhibit CV syllables” (196-197). This assertion is examined in the two texts, with multisyllabic words in each novel separated as an English-speaker would pronounce them (assumed from English writer’s intention).

*Snow Crash* included CV syllables prominently in its text, the utterances made up mostly of single syllables, many which were CV structured. This can be shown in utterance 5 of Figure 1 below:

**“ba la zin ka nu pa ra ta”**

This utterance is composed almost entirely of CV syllables. Figure 6.1 shows that overall, the *Snow Crash* babble included 94 CV syllables out of a total 144 syllables uttered for a total ratio of 65.3%.

*Lexicon*’s data set also included CV syllables prominently in the text. Following duality of patterning, the attention words, assumed to be meaningful, are made up of multiple phonemes that compose syllables. Of these syllables, CV syllables are present, an example being from utterance 7 of Figure 2, separated into syllables here with ‘|’:

**“la | lli | to... | ka | va | ki | fa... | fe | do | ri | ant”**

Overall, these CV syllables accounted for 42 of the total 87 syllables of the attention word data set for a ratio of 48.3%.

## 4 Discussion

After reviewing the results of this study, it was determined that both representations of a universal language in *Snow Crash* and *Lexicon* do a successful job of maintaining consistency with phonetic linguistic universals. This can be attributed to the inclusion of almost all linguistically (nearly) universal consonants in both consonant inventories, adherence to implicational universals, inclusion of the universal syllable structure, and, in the case of *Snow Crash*, absence of rare phonemes in language.

An example from the results from *Snow Crash* that illustrates this success is the representation of the linguistically two most common nasal stops in the text. The dental/alveolar nasal [n] was shown in 33 instances over the 6 utterances for a relatively high ratio of 550.0%. The bilabial nasal [m] was used even more frequently, with a ratio of 583.3%. These being so prominent illustrate both the inclusion of two linguistic near-universal consonants but also the following of the implicational hierarchy of nasals in languages, where the inclusion of the bilabial nasal [m] must also mean that [n] is included, which is the case in the babble of *Snow Crash*.

This same point can be extended to an example for *Lexicon*’s success, where both [n] and [m] are included, as well as [ŋ]. The dental/alveolar nasal [n] was most prominent of nasal representation in *Lexicon*, with a ratio of 172.7%, a number also relatively high for the data set. The total ratio of the representation of nasals in *Lexicon*’s attention words is 254.5% and, like

*Snow Crash*, illustrates both the following of the implicational hierarchy of nasals in languages, where in this case, the inclusion of [ŋ] meant that both [m] and [n] had to be included as well.

There was one inconsistency found in the data from *Snow Crash*, where the common approximant [w] was not found present in the data set. This could be attributed to the small size of the data set, with only 6 utterances of the babble found in the novel. However, the other common consonants were represented in the inventory within these 6 utterances, so it could be purposeful lack of inclusion. Also, as a science fiction author, Stephenson may have been focusing more on the effect of the babble representation for the novel as a whole and less on its linguistic background and accuracy.

An inconsistency found in the data from *Lexicon*, where the implicational hierarchy of the voicing of obstruents was broken, the data including [b] but not [p]. Again, this may be attributed to the small size of the data set, with 11 utterances of the attention words found in the novel. Like Stephenson, Barry as a science fiction author could also have been focusing more on the effect of the language representation for his novel as a whole and less on its linguistic background and accuracy.

Another inconsistency with aiming to represent a universal language in *Lexicon* came from its consonant inventory, where it represents phonemes that are relatively uncommon in the world's languages. Referring back to section 3.3, the utterances in *Lexicon* include both [v] and [ŋ] in a combined instances to utterances ratio of 90.0%. This inconsistency may come from the fact that the author is an English speaker writing for an English-speaking audience, and perhaps just making use of both of these phonemes because they are available in the English language.

Overall, these few inconsistencies are outweighed by the success to which the other elements of this study were portrayed, thus giving the overall impression of two believable representations of a universal language in science fiction literature. This is not surprising, considering that the writers of these books and thus these 'languages' are speakers of at least one world language and already have a bias of what human language sounds like.

## **5 Conclusion**

From this study, it was concluded that the concept of a universal language from pre-Babel origin is represented well in both science fiction novels *Snow Crash* by Neal Stephenson and *Lexicon* by Max Barry. Both represented languages initially appeared divergent from Standard American English, but upon further study, were shown here to share phonetic universals, suspending disbelief and validating each novel's representation.

## **Figures**

Figure 1

### *Snow Crash*

#	babble utterance	page #
1	e ne em ma ni a gi a gi ni mu ma ma dam e ne em am an ki ga a gi a gi...	183
2	e ne em dam gal nun na a gi agi e ne em u mu un abzu ka a gi a agi...	183
3	i ge en i ge en nu ge en nu ge en us sa tur ra lu ra ze em men...	183
4	ba ka na zu ma lay ga no ma la aria ma na po no a ab zu...	346
5	ba la zin ka nu pa ra ta...	362
6	me lu lu mu al nu urn me en ki me en me lu lu mu me al nu urn me al nu ume me me mu lu e al nu um me dug ga mu me mu. lu e al nu urn me...	414

Figure 2

### *Lexicon*

#	attention word utterance/string	page #
1	<i>Coarg medicity nighten comense</i>	10
2	<i>Contrex helo siq rattrak</i>	20
3	JUSTITRACT. MEGRANCE. VARTIX.	85
4	<i>Kassonin</i>	93
5	<i>Vartix velkor mannik wissick</i>	115
6	<i>Shakafveeha mannigh danoe!</i>	189
7	<i>lallito... kavakifa... fedoriant</i>	191
8	<i>Volteen... Carlott sissiden nox</i>	199
9	<i>Ventrice hasfal collimsin manning</i>	218
10	<i>Vecto brillia masog vat</i>	236
11	<i>Kinnal forset hallassin aidel</i>	277

## 3.1.1

*Snow Crash*

Oral Stop	# of instances	# of utterances	Ratio of instances to utterances
/t/	2	6	33.3%
/k/	5	6	83.3%
/p/	2	6	33.3%
total	9	6	150.0%

## 3.1.2

*Lexicon*

Oral Stop	# of instances	# of utterances	Ratio of instances to utterances
/t/	17	11	154.5%
/k/	14	11	127.3%
/p/	0	11	0.0%
total	31	11	281.8%

## 3.2.1

*Snow Crash*

Nasal Stop	# of instances	# of utterances	Ratio of instances to utterances
/n/	33	6	550.0%
/m/	35	6	583.3%
total	68	6	1133.3%

### 3.2.2

#### *Lexicon*

Nasal Stop	# of instances	# of utterances	Ratio of instances to utterances
/n/	19	11	172.7%
/m/	8	11	72.7%
total	27	11	245.5%

### 3.3.1

#### *Snow Crash*

Fricative	# of instances	# of utterances	Ratio of instances to utterances
/s/	2	6	33.3%
/f/	0	6	0.0%
total	2	6	33.3%

### 3.3.2

#### *Lexicon*

Fricative	# of instances	# of utterances	Ratio of instances to utterances
/s/	13	11	118.2%
/f/	5	11	45.5%
total	18	11	164.6%

### 3.4.1

#### *Snow Crash*

Liquid	# of instances	# of utterances	Ratio of instances to utterances
/l/	15	6	250.0%

### 3.4.2

#### *Lexicon*

Liquid	# of instances	# of utterances	Ratio of instances to utterances
/l/	12	11	109.1%

### 3.5.1

#### *Snow Crash*

Approximant	# of instances	# of utterances	Ratio of instances to utterances
/w/	0	6	0.0%

### 3.5.2

#### *Lexicon*

Approximant	# of instances	# of utterances	Ratio of instances to utterances
/w/	1	11	9.1%

### 4.1.1

#### *Snow Crash*

Obstruent	# of instances	# of utterances	Ratio of instances to utterances
/d/	1	6	16.6%
/t/	2	6	33.3%
total	3	6	50.0%

### 4.1.2

#### *Lexicon*

Obstruent	# of instances	# of utterances	Ratio of instances to utterances
/d/	5	11	45.5%
/t/	17	11	154.5%
total	22	11	200.0%

## 4.2.1

*Snow Crash*

Obstruent	# of instances	# of utterances	Ratio of instances to utterances
/b/	4	6	66.6%
/p/	2	6	33.3%
total	6	6	100.0%

## 4.2.2

*Lexicon*

Obstruent	# of instances	# of utterances	Ratio of instances to utterances
/b/	1	11	9.1%
/p/	0	11	0.0%
total	1	11	9.1%

## 4.3.1

*Snow Crash*

Nasal	# of instances	# of utterances	Ratio of instances to utterances
/n/	33	6	550.0%
/m/	35	6	583.3%
/ŋ/	0	6	0.0%
total	68	6	1133.3%



#### 4.3.2

##### *Lexicon*

Nasal	# of instances	# of utterances	Ratio of instances to utterances
/n/	19	11	172.7%
/m/	8	11	72.7%
/ŋ/	1	11	9.1%
total	28	11	254.5%

#### 4.4.1

##### *Snow Crash*

Affricate	# of instances	# of utterances	Ratio of instances to utterances
[tʃ]	0	6	0.0%
[dʒ]	0	6	0.0%
total	0	6	0.0%

#### 4.4.2

##### *Lexicon*

Affricate	# of instances	# of utterances	Ratio of instances to utterances
[tʃ]	0	11	0.0%
[dʒ]	1	11	9.1%
total	1	11	9.1%

## 5.1

*Snow Crash*

Uncommon Phoneme	# of instances	# of utterances	Ratio of instances to utterances
/θ/	0	6	0.0%
/v/	0	6	0.0%
/ŋ/	0	6	0.0%
total	0	6	0.0%

## 5.2

*Lexicon*

Uncommon Phoneme	# of instances	# of utterances	Ratio of instances to utterances
/θ/	0	11	0.0%
/v/	9	11	81.8%
/ŋ/	1	11	9.1%
total	10	11	90.9%

## 6.1

Book	CV syllable instances	total # syllables	Ratio
<i>Snow Crash</i>	94	144	65.3%
<i>Lexicon</i>	42	87	48.3%

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# Annotated Data

Figure 1  
Snow Crash

■ obstruent d/t    ○ oral stop  
■ approximant    ○ nasal stop  
□ obstruent s/p    ○ fricative  
◆ liquid  
□ nasal n    ◇ alfricak        uncommon phoneme

#	babble utterance	page #
15 12	1 e ne em ma hi a gi a gi hi mu ma ma dam e ne em am ah ki ga a gi a gi...	183
12	2 e ne em dam gal nu hi na a gi agi e ne em u mu un abzu ka a gi a gi...	183
13	3 i ge en i ge en nu ge en nu ge en us sa tur ra lu ra ze em meh...	183
14	4 ba ka na zu ma lay ga no ma la aria ma na po no a ab zu...	346
19	5 ba la zin ka nu pa ra ta...	362
31	6 me lu lu mu al nu un me en ki me en me lu lu mu me al nu un me al nu un me me mu lu e al nu un me dug ga mu me mu. lu e al nu un me...	414

Figure 2  
Lexicon

#	attention word utterance/string	page #
10   7	1 Coarg medidly nighten comense	10
7   2	2 Contrex helo sig rattak	20
7   2	3 JUSTITRACT. MEGRANCE. VARTIX.	85
2   2	4 Kassoni	93
8   2	5 Vartix velkor mannik wissick	115
8   7	6 Shakaf veeha mannigh danoe!	189
11   10	7 lallilo... kavakifa... fedonant	191
8   2	8 Volleen... Carlott (sissiden) nok	199
9   2	9 Ventrice hasfa collimsin manning	218
8   3	10 Veclo brillia masog vat	236
1   3	11 kinna! forse! ballasin aida!	