

# Complex Datasets and Localization: Six Examples

Rick Brannan  
Logos Bible Software<sup>1</sup>

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## Abstract

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The Bible is rich with textual relationships. The textual relations within the Biblical text are frequently studied, but the relationships between the Biblical text and other ancient literature do not play as large a role, probably due to the difficulty in tracking them down. Logos Bible Software is developing data that classifies relations between the Biblical text and literature such as Talmuds, sectarian Dead Sea Scrolls, Pseudepigrapha, and other corpora. These sorts of textual relationships matter because they shed light on how the Biblical text was used and understood in antiquity. They also provide greater insight to ancient cultures. With this sort of data available, when studying a Bible passage it will be easier to examine possible relations between the current passage and a wealth of ancient literature. The references have been classified as intertextually related (citation, quotation, allusion, echo), topically related (topical, historical), or lexically related (phrase, word). Further, because these references are abstracted to their structure and the relationships use a limited vocabulary, the reference and relationship can be localized to languages other than English when located and displayed within Logos Bible Software, making this valuable data available to those working with primary languages other than English.

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<sup>1</sup> Author email: rick@logos.com

# Introduction

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Innovative tools usually suffer from being bound to the particular language they are developed in. Localization of the underlying data and analysis is, many times, an afterthought. At Faithlife,<sup>2</sup> we have had localization of our products (primarily Logos Bible Software) in mind since at least 1999.<sup>3</sup>

And this is useful, because at Faithlife, we are producing more and more tools and analyses of the Biblical text. But with each of them we have the problem of ensuring the localization of the result.

One recent example is the introduction of a tool called “Ancient Literature” in Logos 6. What is “Ancient Literature”? It is a curated and classified index of ancient material relevant to Bible passages. It is probably best to explain this tool with an example.

## An Example: Ancient Literature

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Let’s say you’re researching Isaiah 54.

“Sing for joy, barren *woman*; *who* has not borne!  
Burst forth *into* rejoicing and rejoice, *she who* has not been in labor!  
For *the* children of *the* desolate woman *are* more than *the* children of *the* married woman,” says  
Yahweh. (LEB)

So, of course, you read and begin to work through the text to understand it. Perhaps you go to commentaries and whatnot for assistance.

But as you think about and study this verse, you have some questions: How did the Jewish tradition understand the verse? What about the Apostolic Fathers? Was it discussed or cited in the Dead Sea Scrolls? Does Ancient Near-Eastern literature have anything to say about barren women? What about the Old Testament Pseudepigrapha? Philo?

The answer: Yes. Yes, all sorts of sources discuss this verse or ideas relevant to it.

### Jewish Tradition: Babylonian Talmud *b.Ber. I.8:*

**I.8 A.** *A certain min said to Beruriah, “It is written, ‘Sing, O barren woman, who has not born ...’* (Is. 54:1).

B. “Because the woman is barren, should she rejoice?”

C. *She said to him, “Idiot, look at the end of the same verse of Scripture, for it is written, ‘For the children of the desolate shall be more than the children of the married woman, says the Lord’* (Is. 54:1).

D. “*What then is the sense of, ‘Barren woman, who has not born?’*

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<sup>2</sup> “Faithlife Corporation,” formerly Logos Bible Software, is the new name of the company that produces Logos Bible Software, Proclaim! church presentation software, and a host of other Christian media products.

<sup>3</sup> Well, actually, earlier. Logos 1.6, circa 1993-1995, was available in Swedish and Korean forms. Localization of the Logos interface within a single code base (instead of keeping alternate code bases for each language) goes back to 1999 or earlier.

E. “Rejoice, O congregation of Israel, which is like a barren woman [that is,] who has not born children destined for Gehenna *such as yourself.*”<sup>4</sup>

Beruriah is the wife of Rabbi Meir; here she is fielding a question about barren women, specifically referencing Isaiah 54:1. Beruriah’s scorn for the lazy exegesis of the passage by the one consulting her is evident in her response in ‘C’, labeling him an idiot for not reading the rest of the verse, and then in ‘E’ by her declaration that he is destined for Gehenna as well.

## Apostolic Fathers: 2 Clement 2.1–3

<sup>2.1</sup> “*Rejoice, O barren woman who has not given birth, break forth and shout, you who has no birth pains, for many are the children of the deserted woman, more than she who has a husband.*” The one who says, “*Rejoice, O barren woman who has not given birth,*” speaks to us, for our church was barren before children were given to her.<sup>2</sup> And the one who says “*Shout you who has no birth pains,*” means this: offer up our prayers sincerely to God, [we should not grow weary like women in labor].<sup>3</sup> And the one who says, “*For many are the children of the deserted woman, more than she who has a husband,*” since our people seem to be deserted by God, but now we who have believed have become many more than those who seemed to have God.<sup>5</sup>

Here the author of 2 Clement, our earliest available Christian sermon outside of the New Testament, typically dated in the first half of the second century (100–150), uses Isaiah 54:1 to begin his homily. And he gives a phrase-by-phrase exposition of the verse as well.

## Cognate Literature: Enki and Ninmah (Context of Scripture 1.159)

Fifth — she fashioned from it a woman  
    who could not give birth.  
Enki — upon seeing the woman  
    who could not give birth,  
Decreed her fate, he assigned her  
    to do work in the Women’s Quarter.<sup>6</sup>

This does not cite or specifically interact with Isaiah 54:1, but it does refer to a woman unable to give birth. It also shows the cultural notion that a woman unable to give birth was deemed as somehow defective (the larger context of COS 1.159 is a contest between Enki and Ninmah, where Ninmah is creating defective humans and challenging Enki to somehow redeem them or make them useful). Understanding the necessity of the ability to procreate, and the following derision heaped upon those unable to do so, is important for understanding the craziness of commanding Isaiah 54:1’s barren woman to rejoice. She has nothing to rejoice over, and is well aware of it.

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<sup>4</sup> Jacob Neusner, *The Babylonian Talmud: A Translation and Commentary* (Peabody, MA: Hendrickson Publishers, 2011), 56–57.

<sup>5</sup> Rick Brannan, trans., *The Apostolic Fathers in English* (Logos Bible Software, 2012).

<sup>6</sup> William W. Hallo and K. Lawson Younger, *The Context of Scripture* (Leiden: Brill, 1997–), 518.

## Philo: On Rewards and Punishments, 158–161

(158) Then, like an affectionate mother, it shall pity the sons and the daughters whom it has lost, who now that they are dead are, and still more were, when alive, a grief and sorrow to their parents; and becoming young a second time, it will again be fertile as before, and will produce an irreproachable offspring, an improvement on its former progeny; *for she that was desolate, as the prophet says, is now become happy in her children and the mother of a large family.* Which prophetic saying has also an allegorical meaning, having reference to the soul; (159) for when the family is very large, and the soul is full, all kinds of passions and vices, surrounding it like so many children, such for instance as pleasures, appetites, folly, intemperance, injustice, it is sad and diseased; and being exceedingly prostrate through illness, it is near to death, but when it is barren and has no such offspring, or when it has lost them, then it becomes changed in all its parts and becomes a pure virgin, (160) and having received the divine seed, it fashions and brings to life a new family, very admirable in their nature, and of great beauty and perfection, such as prudence, courage, temperance, justice, holiness, piety, and all other virtues and good dispositions, of which not only is their birth a blessing accompanied by happiness in its children, but the mere expectation of such a birth is a blessing, since it cheers its weakness by the anticipations of hope; (161) and hope is joy before joy, even though it may be somewhat defective in comparison with perfect joy. But still, it is in both these respects better than that which comes after; first, because it relaxes and softens the dry rigidity of care; and secondly, because by its anticipations it gives a forewarning of the impending perfect good.<sup>7</sup>

While longer, note the reference to Isaiah 54:1 in §158 with explanation following in §§158b–161. Here Philo provides the perspective of a first-century Alexandrian Jew to counter the perspective of the second-century church given in 2 Clement 2.1.

While this material is somewhat discoverable, it requires an advanced user with a wide-ranging library and decent searching chops. In other words, our typical user will never find these references.

## The Problem: How to Localize?

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The promise of a large library is that data like these noncanonical references to Isaiah 54:1 should just bubble up and make themselves known. Further, with over 280,000 references, this is a large set of data. How can such a large index be both implemented and (relatively) easily localized?

## The Solution?

The solution involves building an index of noncanonical references, ordered by canonical reference. This will allow one to search for a Biblical reference and retrieve the noncanonical references that are associated with it.

Further, as the examples above show, there are different reasons to reference noncanonical text from the Biblical text. Sometimes it is a quotation (2 Clement, Dead Sea Scrolls Sectarian material). Sometimes it is an allusion (Philo, Apocalypse of Elijah). Other cases may be echoes of the Biblical text (2 Baruch). Still others may provide topical or cultural insights (Enki and Ninmah, COS 1.159) that could prove valuable in understanding the text under study.

However, at Logos, we also want to make sure this kind of data can be localized to other languages.

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<sup>7</sup> Philo, *On Rewards* §§158–161. Italics added.

## Principle: Represent Multiple Corpora/Sources

As evidenced in the above example, Logos has many different sources that could be of interest to users. These sources should be gathered in groups, typically representative of a corpus or genre.

- Ancient Near-Eastern Material (e.g. Ugaritic material, Context of Scripture, Ancient Near-Eastern Texts, Amarna Letters, etc.)
- Apostolic Fathers
- Church Fathers
- Dead Sea Scrolls (Sectarian Material)
- Judaica (e.g. Babylonian Talmud, Jerusalem Talmud, Mishnah, Mekhilta, Pesikta, etc.)
- Old Testament Pseudepigrapha
- Nag Hammadi Codices
- New Testament Apocrypha
- Works of Josephus
- Works of Philo

For purposes of localization, the dataset name can be localized.

## Principle: Provide a Type to the Reference

As one can also see from the Isaiah 54:1 example, there are different sorts of relationships between the canonical text and text that can be seen as referring to it or to similar subject material. Knowing the reason for the reference is perhaps as important as the reference itself.

Therefore, in addition to gathering references by corpus/dataset, we have also classified each reference based on a restricted yet relatively wide vocabulary. Relationships include:

- **Citation:** An explicit reference to scripture with a citation formula (e.g. “It is written,” or “the Lord says,” or “the prophet says,” or something along those lines).
- **Quotation:** A direct reference to scripture, largely matching the verbatim wording of the canonical source but without a quotation formula.
- **Allusion:** An indirect but intentional reference to scripture, but likely intended to invoke memory of the scripture.
- **Historical:** A specific referent is in common with scripture.
- **Echo:** A verbal parallel evokes or recalls a scripture (or series of scriptures) to the reader, but likely without authorial intention to reproduce exact words.
- **Topical:** A general referent in common with scripture, but not exactly the same word or phrase.
- **Lexical:** A word or phrase in common that could be useful for lexical studies, but no intertextual reference intended.

This labeling/qualifying of references allows users to focus on information they are interested in. If intertextuality is the interest, labels like “Historical”, “Topical”, and “Lexical” can be safely ignored. If word studies, then the “Lexical” type can be the focus of study.

## Principle: Use Abstracted Forms of References

Within Logos Bible Software, we have had to support a language-neutral representation of Bible references in order to properly index and render references for a given user interface. This has been the case for years. We have also supported language-neutral representations of non-Bible references. This allows us to render supported references in a variety of contexts (short for a browse box like “Jn 1:1,” longer for search hits like “John 1:1”) and also in a variety of supported languages. It also allows support of the European preference of “.” as a chapter-verse separator (“Jn 1.1” compared to “Jn 1:1”).

Because all of the Bible and non-Bible references within the Ancient Literature tool use these abstracted language-neutral schemes, the reference citations can be rendered in any supported language.

## Overall Effect: Localization with Minimal Effort

The combination of the three principles results in establishing a minimal set of categories and reference relationships for localization. In the case of the Ancient Languages tool there were fewer than 30 unique strings of text to localize. This course assumes that Bible and non-Biblical references have, if necessary, already been abstracted and localized and that one can render appropriate citations from the abstraction.

## An Aside: Tools for Localization

Organizing data is important to facilitate localization, but the bulk of work (at least as has been experienced at Logos/Faithlife) is in actually translating material from English into a target language.

This process has taken many forms over the years, both informal and formal. We've crowdsourced translations (in 1998!), we've commissioned professional translations, and done all sorts of crazy stuff. Presently there are language-centric teams within Faithlife (Spanish, German, French, and others) that take on the responsibility of configuring, localizing, and selling Logos Bible Software for non-English markets.

Most recently, the process for localization begins with developers and data jockeys providing data in need of localization to the proper team through a localization service. We use a service called CrowdIn (<http://crowdin.com>), which bills itself as a “Localization Management Platform.” Whatever they call themselves, it allows us to provide data

in need of localization to qualified folks that our language-centric teams have individually approved to work on localization projects.

The strings in need of localization get translated and reviewed, and when ready the translated versions can be retrieved and reintegrated into the software, datasets, and resources for delivery to customers.

## Learning from the Solution

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### Case Frames and Semantic Roles

This same approach of grouping things and abstracting things is used elsewhere in Logos 6. Another new feature in Logos 6 has to do with Case Frame analysis and the related Semantic Role analysis.<sup>8</sup>

The application of case frame analysis to Biblical studies was pioneered by Paul Danove. Essentially, case frame analysis as implemented in Logos centers around verbs as units of predication. Conceptually, verbs require external information in order for the reader or hearer to make sense of what is being said. These required pieces of information are called “arguments.”

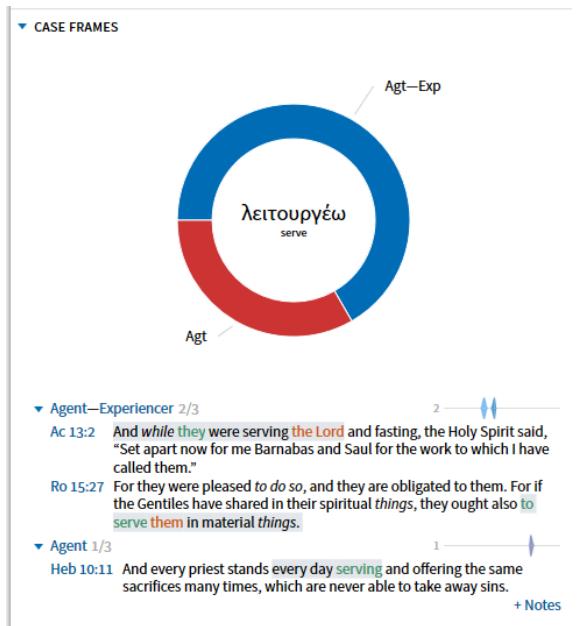
As one example, consider the word λειτουργέω, which carries the sense “to serve”, be it in public or religious service of some sort. When we hear of the concept “to serve”, we can think of some associated pieces of information that help make sense of the verb. The two obvious ones are “who is doing the serving?” and “who is being served?” Case frame analysis labels these associated pieces of information “arguments” and, for verbs, notes that every verb has at least one argument. These arguments are the extra data we need to fully understand the action of the verb and its effect in the discourse or narrative.

The verb λειτουργέω may have up to two arguments. One is the “Agent” (“who is doing the serving?”); the other is the “Experiencer” (“who is being served?”). The case frame is typically shown with the subject-oriented slot first (required), and other slots after, like: Agent—Experiencer, or Agt—Exp. This notation means that the verb (here λειτουργέω) typically has an Agent and an Experiencer as arguments.

In Logos 6, we’ve labeled all verb arguments in the NT and in the Hebrew Bible. Here’s what that data looks like for λειτουργέω:

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<sup>8</sup> The description of case frames and semantic roles is based on similar discussion in *The Lexham Glossary of Semantic Roles*



Within the display, the actual Agent and Experiencer are highlighted. The grey background marks the clause in question. In the first two, the Agent is green and the Experiencer is orange. Note the Ro 15:27 example, where the verb that grammaticalizes the subject is marked as the Agent. The Heb 10:11 involves a middle/passive form of λειτουργέω, and there is no Experiencer in the context.

Using the case frame analysis combined with our referent analysis, we can figure out who (which known entity) is in each semantic role, even though the text only uses pronouns or verb person/number as stated referents. We call this feature “Clause Participants”. Here is an example of the participants in clauses where the verb is λειτουργέω:

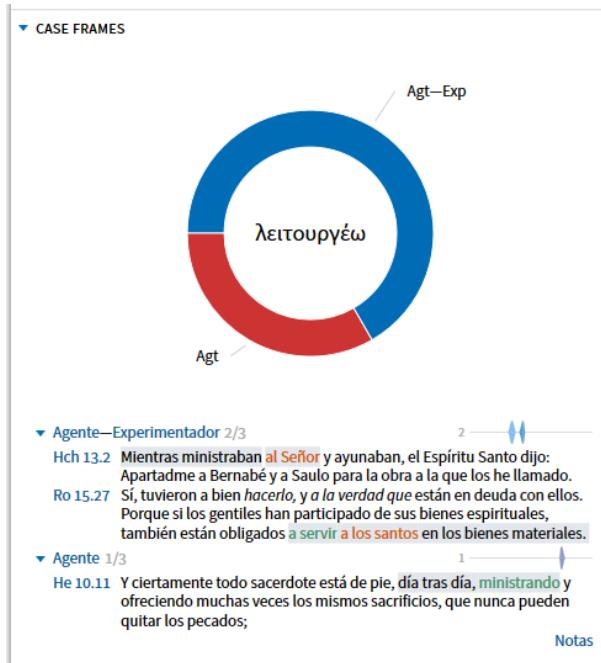


The case frame analysis was carried out on the underlying Greek and Hebrew texts; in Logos we have word-level alignments of modern language translations with the underlying Greek and Hebrew.

## Applying the Lesson

So, we have a complex data set; we have a limited number of labels used to represent data in that set, and we have it applied to Greek and Hebrew texts. In Logos 6, we localize the terminology (in this case, to

Spanish)<sup>9</sup> and when we change the interface and set our preferred Bible to a Spanish Bible with aligned original language text. And here is the case frame section:



The arguments (semantic roles) and case frames are localized; because the Spanish Bible has the Greek New Testament aligned, the highlighted lookup just works. The glossary that explains the terminology has also been translated, so it just works as well.

And here are the semantic roles:



The Faithlife Spanish team had already localized/translated the controlled vocabulary data that represents each person and place in the Bible, so those already worked. So when we localize an analysis that overlays that data, or presents it another way, then that underlying work simply comes along for the ride.

Further, a glossary of terminology was also prepared in English and translated into Spanish:

<sup>9</sup> We also localize portions of the interface; this aspect of localization is under way but not yet complete.

The screenshot shows two side-by-side windows of Logos Bible Software. The left window is titled 'The Lexham Glossary of Semantic Roles' and displays the English glossary. The right window is titled 'Glosario de Roles semánticos' and displays the Spanish glossary. Both windows show a list of semantic roles with their definitions in both languages. The English definitions are as follows:

- Content** — The content of a speech act or of a mental activity, such as thought; for example, "David said to Bathsheba, 'Solomon will be king'" (Content)" or "David thought to himself: Solomon should be king (Content)."
- Cost** — The amount of money or the object a person gives in exchange for another person or thing; for example, "David bought a servant for 30 shekels of silver (Cost)."
- Current** — The present state of a person or thing; for example, "David was sick with madness (Current)."
- Event** — A complete action or event; for example, "David started to fight with the Philistine (Event)."
- Experiencer** — The person or thing that experiences a state or a mental event or activity; for example, "David (Experiencer) saw Goliath."
- Goal** — The place toward which something moves or is moved; for example, "David went to Jerusalem (Goal)" or "David threw the spear to the ground (Goal)."
- Instrument** — The means by which a person or thing performs an action; for example, "David

The Spanish definitions are as follows:

- Contenido** — El contenido de un discurso o de una actividad mental, como un pensamiento; por ejemplo, "David dijo a Betsabé, 'Salomón será rey' (Contenido)" o "David pensó para sí mismo: Salomón debería ser el rey (Contenido)."
- Costo** — El monto de dinero o el objeto que una persona da a cambio de otra persona o cosa; por ejemplo, "David compró un esclavo por 30 piezas de plata (Costo)."
- Destino** — El lugar hacia donde algo se mueve o es movido; por ejemplo, "David fue a Jerusalén (Destino)" o "David arrojó la lanza al suelo (Destino)."
- Estímulo** — La persona, cosa, o evento que trae un cambio mental en la persona que lo experimenta; por ejemplo, "David vio a Goliat (Estímulo)."
- Evento** — Una acción o evento; por ejemplo, "David comenzó a pelear con los filisteos (Evento)."
- Experimentador** — La persona o cosa que experimenta un evento o actividad actual o mental; por ejemplo, "David (Experimentador) vio a Goliat."
- Instrumento** — El medio por el cual una persona

## New Testament Propositional Outlines

Another innovation in Logos 6 is the implementation of what we call “Propositional Outlines.” As with the case frames, Logos completed a propositional flow analysis of the Greek New Testament. This allows one to see the flow of a passage through indentation and labeling with a controlled vocabulary of propositional items. Because the analysis was undertaken on the Greek text, it can be overlaid on any text that is aligned with the Greek New Testament.

The screenshot shows a window of Logos Bible Software displaying the New Testament passage Ephesians 2:1-22. The left sidebar shows the book of Ephesians and the chapter 2. The main text area shows the passage with propositional outlines. The outlines are labeled with numbers and letters, such as 1 a Topic (5b), 2 a Sphere, etc. The text is as follows:

Made Alive in Christ

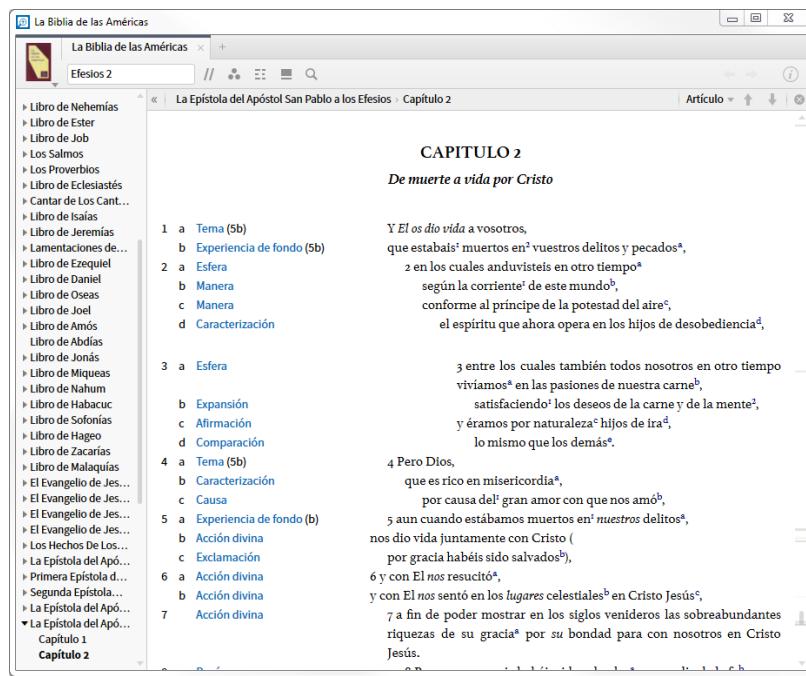
1 a Topic (5b)  
 b Background-Experience (5b)  
 2 a Sphere  
 b Manner  
 c Manner  
 d Characterization  
 3 a Sphere  
 b Expansion  
 c Affirmation  
 d Comparison  
 Supplied  
 4 a Topic (5b)  
 b Characterization  
 c Cause  
 5 a Background-Experience (b)  
 b Divine-Action  
 c Exclamation  
 6 a Divine-Action  
 b Divine-Action  
 7 Divine-Action  
 8 a Reason  
 h Suggestion

And you, although you were dead, <sup>as</sup> in your trespasses and sins, in which you formerly walked according to the course of this world, according to the ruler of the authority of the air, the spirit now working in the sons of disobedience, among whom also we all formerly lived in the desires of our flesh, doing the will<sup>of</sup> of the flesh and of the mind, and we were children of wrath<sup>by</sup> nature, as also the rest of them were. But God, being rich in mercy, because of his great love *with* which he loved us, and we being dead in trespasses, he made us alive together with Christ (by grace you are saved), and raised us together and seated us together in the heavenly *places* in Christ Jesus, in order that he might show in the coming ages the surpassing riches of his grace in kindness upon us in Christ Jesus. For by grace you are saved through faith, and this is not from yourselves. It is the gift of God.

## Applying the Lesson

The analysis uses an English vocabulary, but the terminology can be translated to any language. In Logos Bible Software, the terminology is abstracted, so it can be rendered in any supported language.

As mentioned above, the analysis was completed on the Greek New Testament. This means that any translation that has been aligned at the word level with a Greek New Testament can take on this data through the use of what is called a “Visual Filter”. This means that the analysis can be applied in the translation language. Like:



Here the propositional outline terminology is on the left; the blue text is hypertext and will link to or display the definition of the term on hover (in appropriate language, as the short glossary has also been translated, see below). The indentation shows subordinate/dependent portions of each propositional group. The Bible text is still the normal, active Bible text, so searching, right-clicking to find underlying Greek information, or even reverse interlinear display all still function as expected.

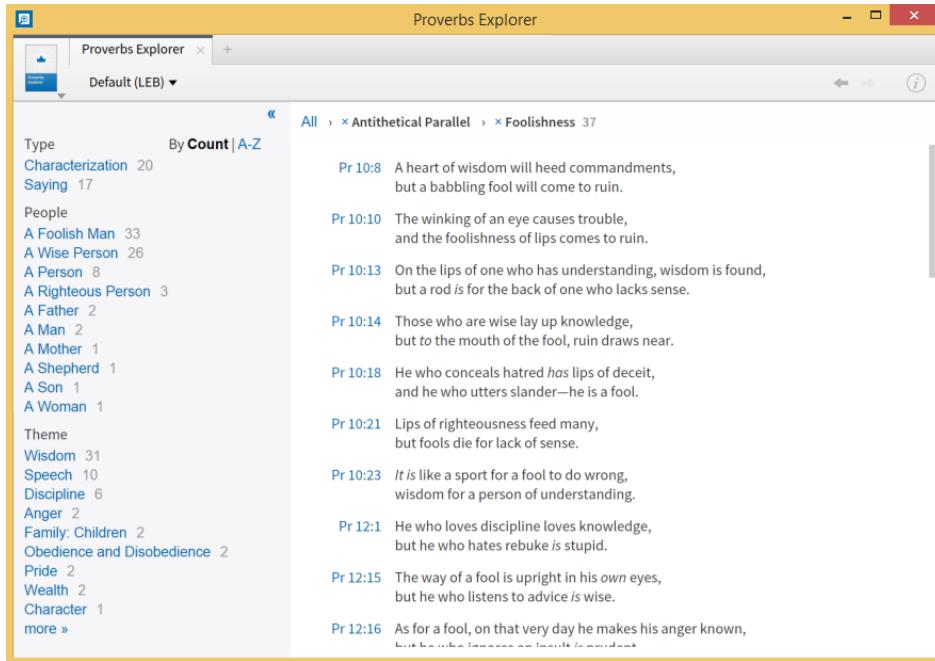
The process can be seen below, with NT Propositional Outlines active on an English text (left, the LEB) and a German text (right, the 1984 Luther Bibel, the alignment of which is still in process and not yet released). The indentation is functional, but as the data type and glossary have not yet been localized, they still are viewed in English.

A similar propositional analysis of the Hebrew Bible is under way and the completed portions are available to subscribers of Logos Now.

## Proverbs Explorer

The release of Logos 6 introduced a new type of resource, the HTML Interactive Resource (“Interactives”). One of the interactives is called the Proverbs Explorer. It is essentially a faceted browser with annotated

information for each proverb found in the book of Proverbs. For example, the below provides a list of proverbs that are antithetical parallels having to do with foolishness:



The screenshot shows a Windows application window titled "Proverbs Explorer". The left sidebar has a tree view with "Type" expanded, showing "Characterization 20" and "Saying 17". Under "Characterization", "A Foolish Man" is listed with a count of 33. The main content area shows a list of proverbs under the heading "All > x Antithetical Parallel > x Foolishness 37". The proverbs listed are:

- Pr 10:8 A heart of wisdom will heed commandments, but a babbling fool will come to ruin.
- Pr 10:10 The winking of an eye causes trouble, and the foolishness of lips comes to ruin.
- Pr 10:13 On the lips of one who has understanding, wisdom is found, but a rod is for the back of one who lacks sense.
- Pr 10:14 Those who are wise lay up knowledge, but to the mouth of the fool, ruin draws near.
- Pr 10:18 He who conceals hatred has lips of deceit, and he who utters slander—he is a fool.
- Pr 10:21 Lips of righteousness feed many, but fools die for lack of sense.
- Pr 10:23 It is like a sport for a fool to do wrong, wisdom for a person of understanding.
- Pr 12:1 He who loves discipline loves knowledge, but he who hates rebuke is stupid.
- Pr 12:15 The way of a fool is upright in his own eyes, but he who listens to advice is wise.
- Pr 12:16 As for a fool, on that very day he makes his anger known,

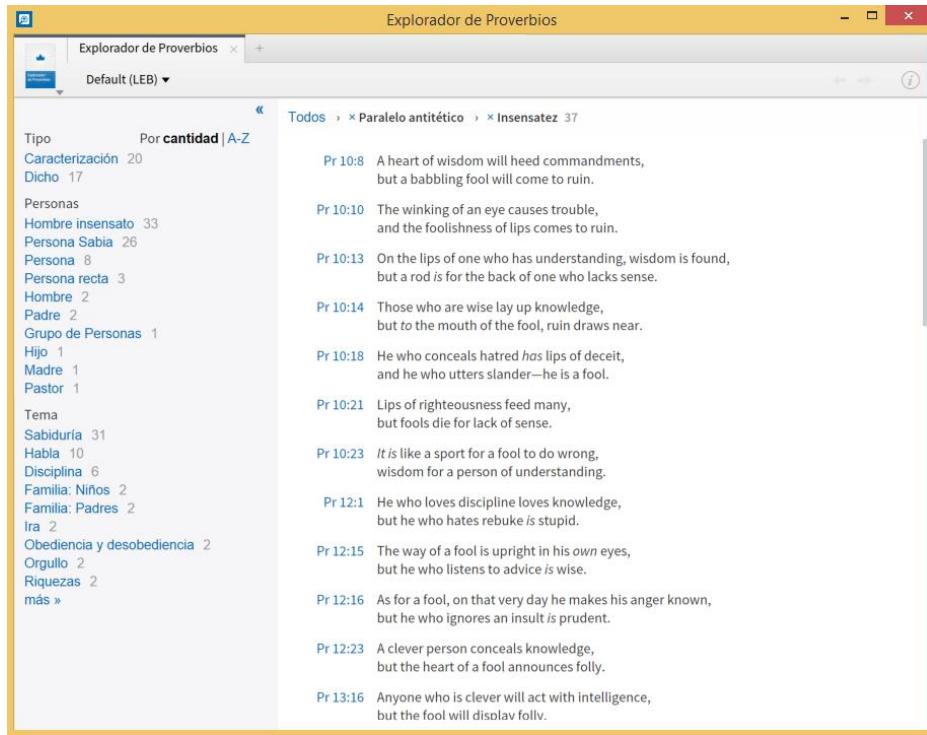
This data was collected originally in a spreadsheet, with columns for each necessary facet. Note that within the columns, we used raw expressions of the abstracted reference (“data type” in our internal vocabulary), but simple strings for things that aren’t abstracted. These strings are the items that were localized.

A	B	C	D	E
Reference	Themes	Type	Pattern	Tags
2 bible.20.1.1-20.1.7	bk.pt:Wisdom, bk.pt:Education, bk.pt:Justice, bk.pt:Right Prologue	List		
3 bible.20.1.8-20.1.19	bk.pt:Education, bk.pt:Family_Fathers, bk.pt:Family_Mot Advice	List		Call to Wisdom
4 bible.20.1.20-20.1.33	bk.pt:Wisdom, bk.pt:Foolishness, bk.pt:Reverence, bk.pt:Ode to Wisdom	List		Call to Wisdom
5 bible.20.2.1-20.2.22	bk.pt:Family_Children, bk.pt:Education, bk.pt:Wisdom, b Advice	List		
6 bible.20.3.1-20.3.12	bk.pt:Family_Children, bk.pt:Obedience, bk.pt:Peace, bk. Advice	List		
7 bible.20.3.13-20.3.35	bk.pt:Blessing, bk.pt:Wisdom, bk.pt:Money, bk.pt:Wealth Advice	List		
8 bible.20.4.1-20.4.27	bk.pt:Family_Fathers, bk.pt:Education, bk.pt:Family_ChildAdvice	List		Call to Wisdom, Beatitude
9 bible.20.5.1-20.5.23	bk.pt:Family_Children, bk.pt:Education, bk.pt:Wisdom, b Advice	List		Call to Wisdom
10 bible.20.6.1-20.6.5	bk.pt:Debt, bk.pt:Borrowing, bk.pt:Humility	Advice	List	
11 bible.20.6.6-20.6.11	bk.pt:Work, bk.pt:Discipline, bk.pt:Laziness, bk.pt:Povert	Advice	List	
12 bible.20.6.12-20.6.15	bk.pt:Honesty, bk.pt:Evil, bk.pt:Judgment, bk.pt:God_Wr Characterization	List		
13 bible.20.6.16-20.6.19	bk.pt:Killing, bk.pt:Pride, bk.pt:Slander, bk.pt:Injustice, bk.pt:Saying	List		
14 bible.20.6.20-20.6.35	bk.pt:Family_Children, bk.pt:Men, bk.pt:Family_Fathers, Advice	List		
15 bible.20.7.1-20.7.5	bk.pt:Family_Children, bk.pt:Men, bk.pt:Family_Fathers, Advice	List		
16 bible.20.7.6-20.7.9	bk.pt:Adultery, bk.pt:SexualImmorality, bk.pt:Sex, bk.pt:Characterization	List		
17 bible.20.7.10-20.7.23	bk.pt:Adultery, bk.pt:SexualImmorality, bk.pt:Sex, bk.pt:Characterization	List		Personification
18 bible.20.7.24-20.7.27	bk.pt:Adultery, bk.pt:SexualImmorality, bk.pt:Sex, bk.pt:Advice	List		
19 bible.20.8.1-20.8.11	bk.pt:Wisdom, bk.pt:Education, bk.pt:Foolishness, bk.pt:Ode to Wisdom	List		
20 bible.20.8.12-20.8.21	bk.pt:Wisdom, bk.pt:Reverence, bk.pt:Evil, bk.pt:Pride, b Ode to Wisdom	List		Personification
21 bible.20.8.22-20.8.31	bk.pt:Creation, bk.pt:Wisdom, bk.pt:Eternity, bk.pt:Joy	Ode to Wisdom	List	Personification
22 bible.20.8.32-20.8.36	bk.pt:Wisdom, bk.pt:Blessing, bk.pt:Family_Children, bk.pt:Ode to Wisdom	List		Personification
23 bible.20.9.1-20.9.6	bk.pt:Wisdom, bk.pt:Alcohol, bk.pt:Education, bk.pt:RightOde to Wisdom	List		Personification
24 bible.20.9.7-20.9.9	bk.pt:Reverence, bk.pt:Repentance, bk.pt:Guidance	Advice	List	
25 bible.20.9.10-20.9.12	bk.pt:Wisdom, bk.pt:Reverence	Ode to Wisdom	List	Call to Wisdom, Conditional
26 bible.20.9.13-20.9.18	bk.pt:Foolishness, bk.pt:Stealing, bk.pt:Death, bk.pt:Adul Characterization	List		Personification
27 bible.20.10.1	bk.pt:Wisdom, bk.pt:Family_Children, bk.pt:Family_FathSaying	Antithetical Parallel		
28 bible.20.10.2	bk.pt:Evil, bk.pt:Righteousness, bk.pt:Wealth, bk.pt:StewSaying	Antithetical Parallel		
29 bible.20.10.3	bk.pt:Righteousness, bk.pt:God_Providence, bk.pt:Evil	Saying	Antithetical Parallel	
30 bible.20.10.4	bk.pt:Laziness, bk.pt:Poverty, bk.pt:Work, bk.pt:Wealth,   Consequence	Antithetical Parallel		
31 bible.20.10.5	bk.pt:Laziness, bk.pt:Honor, bk.pt:Work, bk.pt:Wisdom	Characterization	Antithetical Parallel	
32 bible.20.10.6				

## Applying the Lesson

So, to localize, the “Type” and “Pattern” (we decided against using the “Tags”) were extracted and uploaded to CrowdIn for localization. Approved contractors completed the localization, and we reintegrated the data to build a localized version of the interactive.

The Spanish localization is completed, and looks like the below:



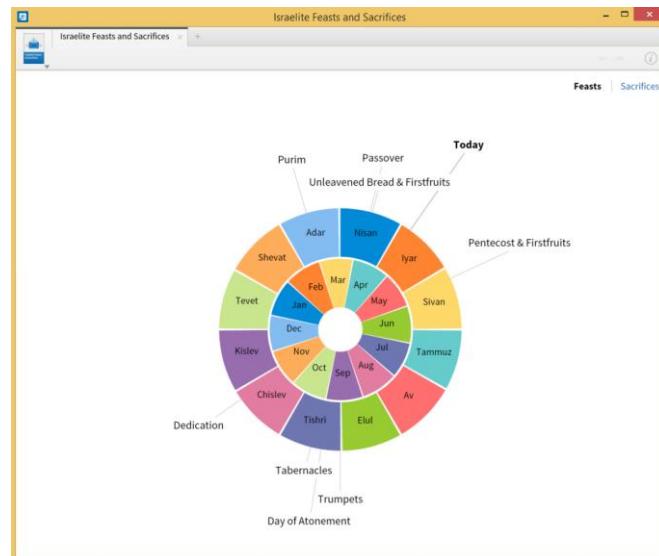
The screenshot shows the 'Explorador de Proverbios' (Proverbs Explorer) interface in Spanish. The left sidebar lists categories and their counts: 'Caracterización' (20), 'Dicho' (17), 'Personas' (33), 'Hombre insensato' (33), 'Persona Sabia' (26), 'Persona' (8), 'Persona recta' (3), 'Hombre' (2), 'Padre' (2), 'Grupo de Personas' (1), 'Hijo' (1), 'Madre' (1), 'Pastor' (1). The main content area shows a list of proverbs with their English translations:

- Pr 10:8 A heart of wisdom will heed commands, but a babbling fool will come to ruin.
- Pr 10:10 The winking of an eye causes trouble, and the foolishness of lips comes to ruin.
- Pr 10:13 On the lips of one who has understanding, wisdom is found, but a rod *is* for the back of one who lacks sense.
- Pr 10:14 Those who are wise lay up knowledge, but to the mouth of the fool, ruin draws near.
- Pr 10:18 He who conceals hatred *has* lips of deceit, and he who utters slander—he is a fool.
- Pr 10:21 Lips of righteousness feed many, but fools die for lack of sense.
- Pr 10:23 *It is* like a sport for a fool to do wrong, wisdom for a person of understanding.
- Pr 12:1 He who loves discipline loves knowledge, but he who hates rebuke *is* stupid.
- Pr 12:15 The way of a fool is upright in his own eyes, but he who listens to advice *is* wise.
- Pr 12:16 As for a fool, on that very day he makes his anger known, but he who ignores an insult *is* prudent.
- Pr 12:23 A clever person conceals knowledge, but the heart of a fool announces folly.
- Pr 13:16 Anyone who is clever will act with intelligence, but the fool will display folly.

Again, since the translation of Bible references, Bible Knowledgebase information (People, places, and things) as well as what we call “Preaching Themes” have already been abstracted and localized, they simply come along for the ride here.

## Israelite Feasts and Sacrifices

The Israelite Feasts and Sacrifices has a faceted browsing component similar to the Proverbs Explorer as well as a feast calendar that is a bit different. The feast calendar is a circular calendar that allows comparison of the present Jewish calendar with the standard western calendar.



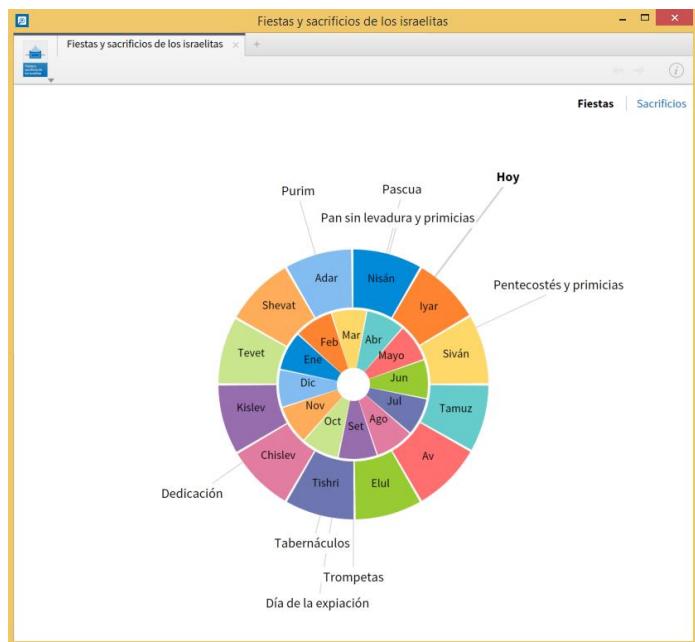
Further, there is a faceted browser with all sorts of data about sacrifices, including the reference found, who made the offering, when and why the offering was made, the type of offering, and the like. For example, if one wanted a list of Blood offerings offered by Levites:

This portion of the work was done similarly to the Proverbs Explorer. A spreadsheet was used to aggregate data about sacrifices; existing datasets were incorporated as necessary.

A	B	C	D	E	F
reference	occasion	_occasionUrl	purpose	type	content
2 Gen 4:3	Unknown		Thanksgiving	Burnt	vegetables
3 Gen 4:4	Unknown		Thanksgiving	Burnt	animals
4 Gen 8:20-21	The flood subsides	logos4:Factbook;ref=bk.*FloodSubsid	Thanksgiving	Burnt, Whole	animals
5 Gen 15:9-11	God makes a covenant with	logos4:Factbook;ref=bk.*CovenantW	Covenant	Other	heifer, female go
6 Gen 22:2-13	God tells Abraham to sacrifice	logos4:Factbook;ref=bk.*Sacrificesa	Dedication	Burnt, Whole	ram
7 Gen 31:54	Jacob and Laban make a cov	logos4:Factbook;ref=bk.*Sacrificesa	Covenant	Burnt	Unknown
8 Gen 35:14	Jacob wrestles with God	logos4:Factbook;ref=bk.*JacobWrestl	Covenant	Drink	drink, oil
9 Gen 46:1-4	Jacob travels to Beersheba	logos4:Factbook;ref=bk.*GodSpeaksE	Thanksgiving	Burnt	Unknown
10 Exod 5:1-5	God meets with the Hebrew	logos4:Factbook;ref=bk.*AskFeastWil	Worship	Burnt	Unknown
11 Ex 10:25	Pharaoh offers to let the Isra	logos4:Factbook;ref=bk.*PharaohLast	Worship	Burnt, Whole	animals
12 Exod 12:14-20	Feast of Unleavened Bread	logos4:Factbook;ref=bk.\$25FeastOfU	Memorial	Meal	unleavened bread
13 Exod 12:21-27	Passover	logos4:Factbook;ref=bk.\$25Passover	Memorial	Meal	lamb
14 Exod 13:6-10	Feast of Unleavened Bread	logos4:Factbook;ref=bk.\$25FeastOfU	Memorial	Meal	unleavened bread
15 Exod 13:11-15	Dedication of firstborn	logos4:Factbook;ref=bk.\$25firstborn	Dedication	Burnt	firstborn males
16 Exod 18:12	Jethro visits Moses	logos4:Factbook;ref=bk.*JethroVisitsI	Thanksgiving	Burnt, Whole	unknown
17 Exod 20:22-26	Daily	logos4:Factbook;ref=bk.\$25dailySacri	Memorial	Burnt, Whole	sheep, cattle

## Applying the Lesson

The localization of the feast calendar involved translating month names as well as feast information.

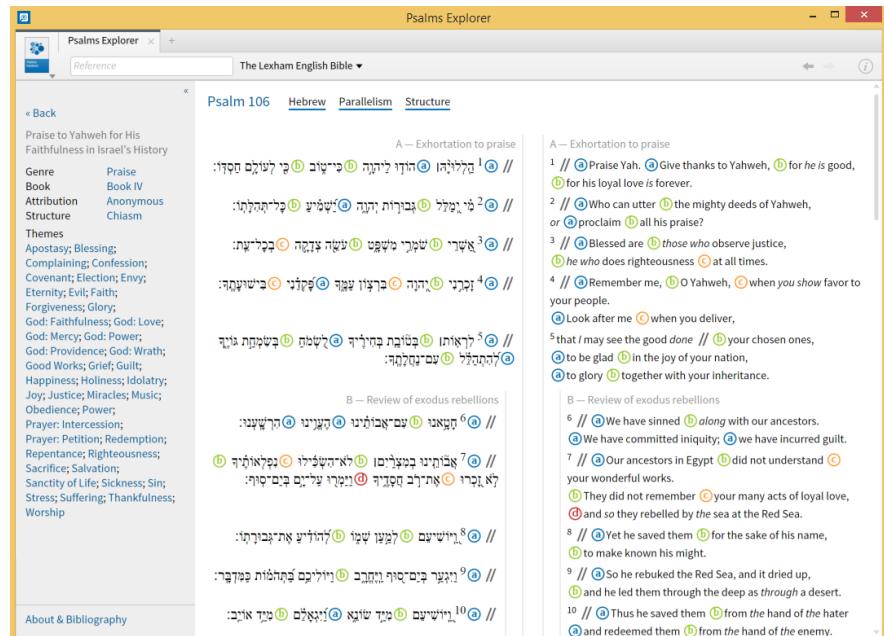
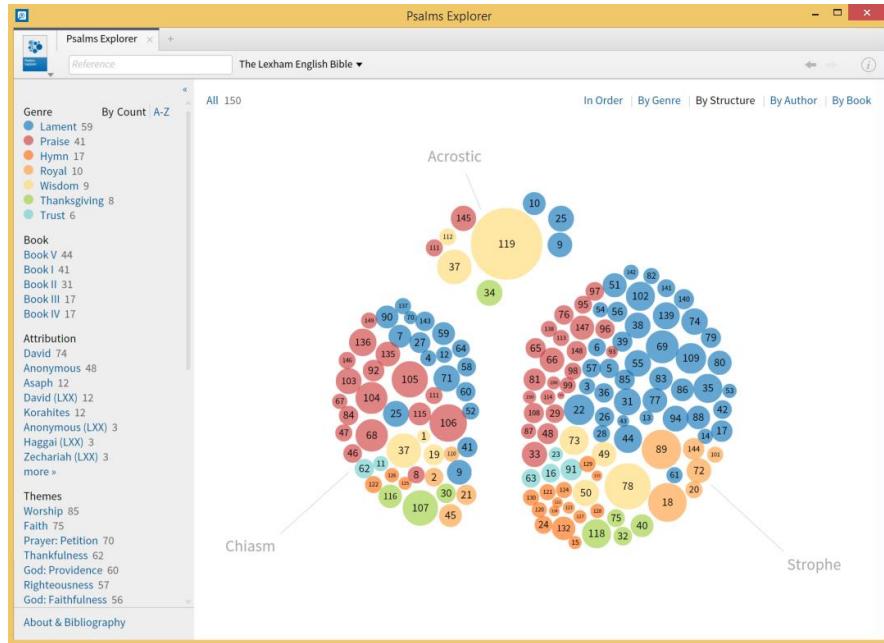


The localization of the Sacrifice data

Referencia	Ofrendante	Ocasión	Propósito	Tipo	Contenido
2 Ch 30:15-17	Levititas; Sacerdotes	Ezequías celebra la pascua	Dedicación	Quemado; Todo; Sangre	Animales
Eze 43:18-21	Levititas	Dedicación del nuevo altar	Dedicación	Quemado; Sangre	Animales
Eze 43:19-20	Levititas	Dedicación del nuevo altar	Expiación; Purificación	Pecado; Sangre; Quemado	Toro
Eze 43:21	Levititas	Dedicación del nuevo altar	Expiación; Purificación	Pecado; Sangre	Macho Cabrío
Eze 43:25-26	Levititas	Semana de la purificación del altar nuevo	Expiación; Purificación	Quemado; Sangre	Toro; Carnero
Eze 44:15	Levititas	Servicio en el templo	Adoración	Sangre	Animales; Grasa Animal

## Psalms Explorer

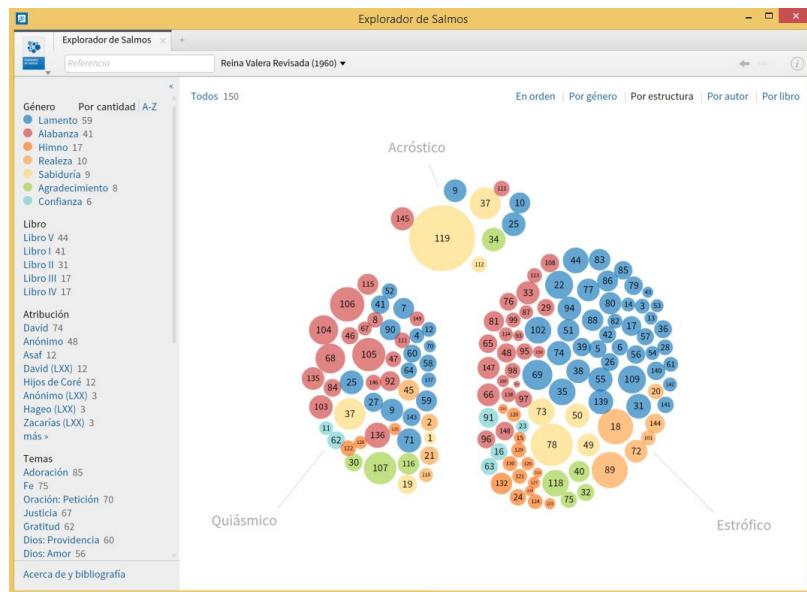
The Psalms Explorer is a collection of data about Psalms found in the book of Psalms at the micro- and macro-level. At the macro-level, data about whole Psalms is aggregated. At the micro-level, structural and parallelism data within each Psalm is displayed.



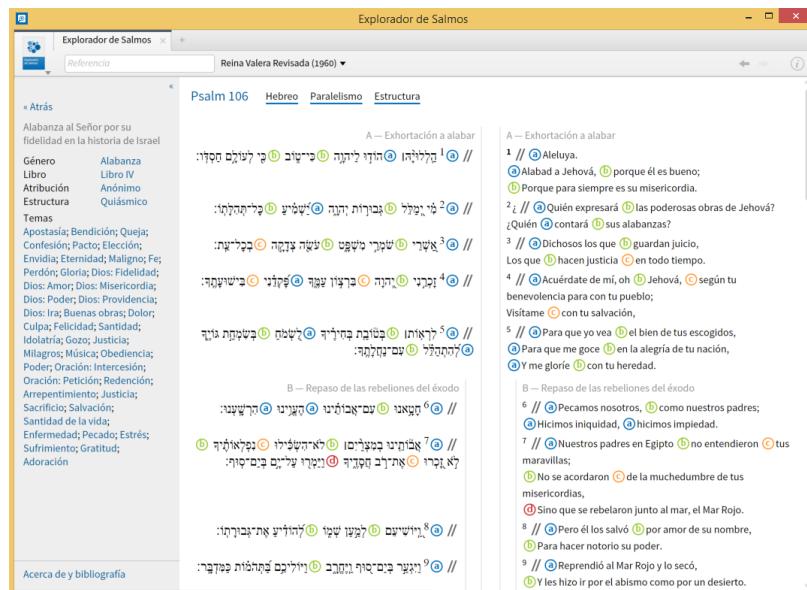
The macro-level data contains information about genre, attribution, structure, and themes at the Psalm level. The micro-level data is an analysis of parallelism (cf. Adele Berlin) and structure (chiastic, acrostic, etc.) in each Psalm. The structure and parallelism analysis was undertaken on the Hebrew Bible, so it can be applied to any translation aligned with the Hebrew Bible.

## Applying the Lesson

The macro-level data was localized using strategies similar to other localization efforts described above: Extract unique strings, translate them, and reinsert localizations. The result:



While the micro-level analysis is more complex, because it was undertaken on the Hebrew text, only a few labels and label definitions needed to be localized. The result, when used with a translation that is aligned with the Hebrew text is:



## Conclusions

In this paper, several new datasets have been discussed. These datasets are wide ranging, from data on how the Bible text has been used in other related cognate literature (Christian and otherwise) to cutting-edge semantic analyses of the Bible to a new set of propositional outlines of the New Testament, to datasets focused on particular areas of Biblical studies.

Each of these sets of data have been localized to Spanish (and will also be localized to German, French, and other languages in the future). In taking a high-level view of these datasets, we find the following features in common:

- Limited terminology
- Tight association between data points
- Reliance on previous localization work

Further, particularly with the semantic analysis and propositional analysis, the detailed word-level alignment between a modern translation and the underlying original language text is essential. Such an alignment allows an analysis undertaken on the underlying text to be applied to all texts that have been aligned to the original language text.

Localization is hard work. At Logos, development on original datasets targeted to English language readers and speakers never ends. Localizing all of this material is difficult. But once primary work is done in the original languages, localizing subsequent datasets gets easier because all of the moving parts of the software and underlying original language alignments are continually available. Once an analysis is complete in English, localizing it to a particular language can be, as shown here, as simple as translating the vocabulary of the common components and letting the rest of the software do its work.