

# Categorizing Bible References in Ancient Language Grammars

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## Abstract

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Ancient language grammars (Greek, Hebrew, Aramaic, etc.) routinely reference the Biblical text to provide examples of grammatical phenomena. When you're actually reading the grammar, you have context for these references. But if, as happens frequently in Bible software, you're looking at the results of a search for instances of a particular Bible reference to see if it is commented on in grammars, you have little or no context to decide if the grammar itself is worth consulting.

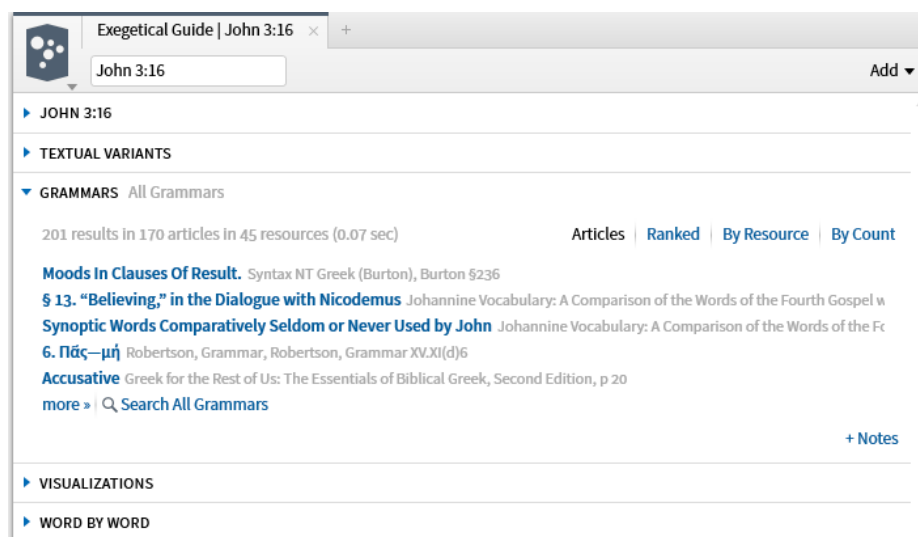
This paper is about an in-development update to the existing "Grammars: section in the Logos Exegetical Guide. This update relies on an analysis and categorization of Bible reference citations within existing original language grammars and presents them in a manner similar to how Logos 6 Ancient Literature references are presented. In this way, people are presented with a reason for the link to the grammar before clicking on it; hopefully leading to more productive study and sermon preparation. We will overview the scope of the problem and volume of data, as well as examine classification methods we've used to help solve the problem.

## Understanding the Problem

Sometimes interpretation hinges on grammatical questions. Other times, something is just hard to understand and help is needed. Whatever the reason, consulting a grammar of an ancient language such as Hebrew or Greek for help understanding a particular word, phrase, or clause is common practice.

In the age of Bible software, which typically index all Biblical references, an even more common practice is to search a grammar or set of grammars for a reference under study. After all, if one is studying John 3:16, then consulting discussions in ancient language grammars that actually mention John 3:16 could be helpful.

But sometimes it isn't as helpful as one might think, especially for common verses, because there can be a lot of hits:



This search for references to John 3:16 across all available ancient language grammars returns over 200 results in 170 different articles. They can be filtered down in different ways, but that is still a lot of stuff to read and consider.

Also, there isn't much information about each hit. Why would it even need to be consulted? What is it talking about? Will it really help with the present question? And: Which language does the grammar treat? (which is a real question regarding OT references).

And that's the problem. How can the incredibly relevant information held within ancient language grammars be presented to direct users to the material best suited to answer their questions?

## Solving the Problem

Honestly, a solution to this problem has not been directly requested. Nobody has given feedback like "You know, I'm just getting far too many hits when I search my grammars, and I can't find material that is relevant to my question."

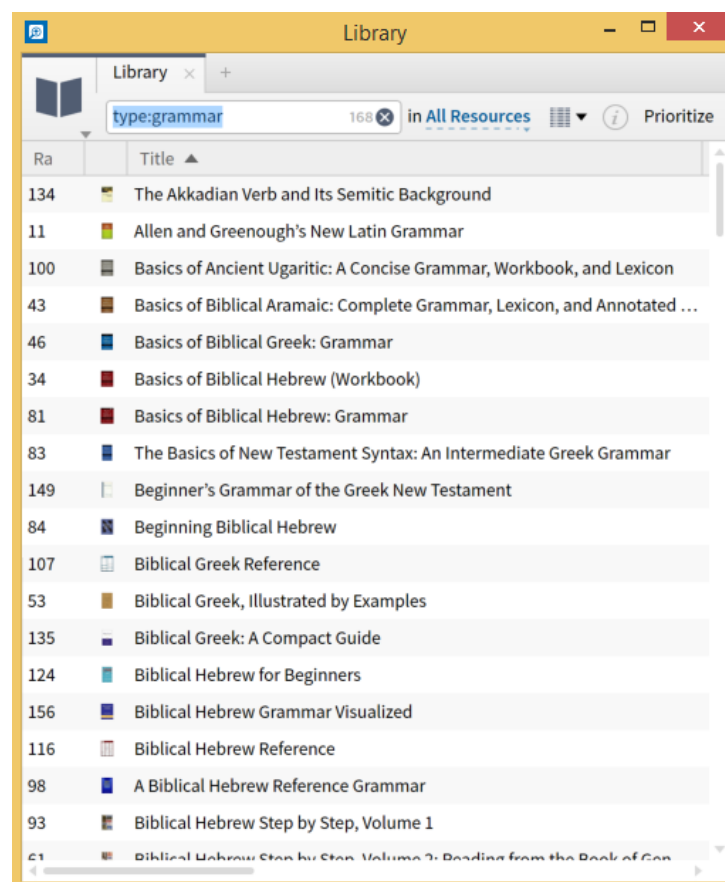
The guess is that folk use the Grammars section of Exegetical Guide (6.2 and previous) as it comes. They evaluate a few hits that may look helpful, and then move on. That is, they aren't really using it to dig

deeply into the grammars as references to assist with a current study or question. They never find the information that may help them better understand the grammar of the passage they are evaluating.

So, after the success of the Ancient Literature feature in Logos 6, which classifies the relationship between Bible references and their use within other ancient literature, we thought that similar ideas could be applied to ancient language grammars. How could these grammars be grouped together? How could their use of Bible references be classified?

## Step 1: Determining Grammars

The step of determining the grammars is probably the easiest because it is already done. Each resource in Logos Bible Software declares a resource type. One of the resource types is “Grammar”; and it exists specifically for the 6.2 and previous versions of the Grammars section.<sup>1</sup>



Further, the list is narrowed by only considering those grammars that contain Bible references.

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<sup>1</sup> Note that the revised Grammars section is a component shipped with Logos Now (<http://logos.com/now>). So users without a Logos Now license but who do have Logos 6.3 installed will see the older Grammars section and not the newly revised Grammars section.

## Step 2: Grouping Grammars

In addition to determining the grammars to represent, the list of grammars needed to be split into logical groups. Since grammars typically deal with a single language, grouping grammars by the language they treat seems to be the proper direction.

The distribution is as follows; the formal groups at time of presentation are listed in the appendix.

- **Greek:** 66 resources
- **Hebrew:** 40 resources
- **Ugaritic:** 6 resources
- **Latin:** 5 resources
- **Aramaic:** 4 resources
- **Syriac:** 2 resources
- **Akkadian:** 1 resource
- **Hittite:** 1 resource
- **Old Babylonian:** 1 resource

As expected, Hebrew and Greek grammars dominate the list.

## Step 3: Finding References

After selecting and grouping resources, each resource must be evaluated for Bible references.

Thankfully, Bible references in grammar resources in Logos Bible Software are already tagged, so we just access the resource and aggregate the references. We also keep track of where the reference is located, surrounding context (a sliding window of characters), article/section title (and complete title hierarchy).

Further, and this is probably the single context where I can make a statement like this and have it be appreciated: *not all references are created equal*. That is, “Psalm 23:1” isn’t always Psalm 23:1. The Hebrew Bible may use a different reference scheme than an English translation. And, since we are talking about ancient language grammars, that means the Septuagint and Vulgate are in play too; and they each have different reference representations. So we don’t only need to harvest references, we need to convert them into a canonical, standardized representation. For purposes of this approach, we use the NRSV as it is widely recognized and used, spans both deuterocanonical (Sirach, Judith, Tobit, 1–3 Maccabees, etc.) and several apocryphal (e.g. 4 Maccabees, Wisdom of Solomon, etc.). So references were harvested and standardized, so they would link to the proper locations in the proper Bible editions, no matter what user preferences might be.

Why keep so much information? It helps with the later classification step. And, with over 260,000 references aggregated, the classification step is a big one.

## Step 4: Categorizing References

The meat and potatoes of this tool is the categorization of context in which references occur.

Knowing the context for a reference is helpful in determining whether or not to follow up on a particular reference trail. Therefore, in addition to gathering references by group, references have also been classified based on a restricted yet relatively wide vocabulary. Relationships include:

- **Prolegomena:** The reference is found in front matter or introductory material.
- **Exegesis:** The reference is found in a context related to exegesis.
- **Orthography:** The reference is found in a context that discusses orthographical. This includes discussion on how words are spelled. Alternately, it may have to do with the alphabet of the language in question.
- **Phonology:** The reference is found in a context that discusses phonology. This includes discussion on how letters, syllables, and words are audibly heard.
- **Etymology:** The reference is found in a context that discusses etymology. This includes discussion on the development of a word or concept across time and language.
- **Morphology:** The reference is found in a context that discusses morphology. This has to do with word formation, conjugation or declination of forms, parts of speech, and other criteria. This is the most common context within grammars focused on Biblical languages.
- **Syntax:** The reference is found in a context that discusses syntax or syntactic phenomena. Such discussion is usually less about single words and more about how words go together to form phrases, clauses, and sentences.
- **Discourse:** The reference is found in a context that discusses phenomena or qualities of discourse grammar or discourse analysis.
- **Style:** The reference is found in a context that discusses style or rhetoric.
- **Vocabulary:** The reference is found in a vocabulary section of a grammar, or a section focused on providing definitions of words.

The problem, of course, is categorizing the references.

## Great ideas that didn't work well

Using the premise “try the simplest thing that might work,” we began exploring the categorization of references using a keyword-based approach. For each category, keywords indicative of that category were associated with it.

So, for a topic like “Morphology,” keywords typical to morphological analyses were included. For items like “Syntax,” keywords like “sentence,” “clause,” “phrase,” and the like were included. We were able to assemble extensive lists through an iterative approach, examining reference contexts that were unclassified for keywords that could indicate a particular classification.

Anecdotally, these keyword lists did a decent job at classification. But we decided to test them by having a colleague manually categorize nearly 2,000 references and then compare the keyword-driven classification against the manual classification.

We didn't do so well. While in baseball, batting around .500 would be awesome, here it didn't seem so great. We tried a few different modifications of the approach to see if it could be corrected. These modifications included:

- Using the keywords against article titles and their ancestors (instead of the whole text of the article)
- Using the keywords against a window of text (approx. 50 characters) around the reference in question (instead of the whole text of the article)
- Using both titles and a window of text

While some minimal improvement was gained, it was too little. So we decided to bring in the big guns.

## Using a Decision Forest (Peter Venable)

[See Peter's Slides]

## Step 5: Delivering a Solution

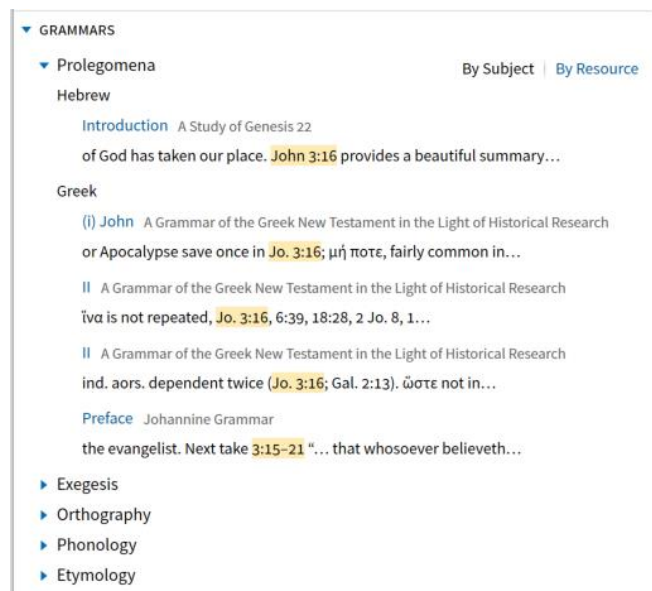
References are classified and resources are grouped. How will users end up interacting with this data?

In the application, the user experience will be similar to how Ancient Literature references are displayed. There are two available views, one is “By Subject” (or classification, or type) and the other is “By Resource” (or group).

Unlike the Ancient Literature guide section, only references in resources licensed on a particular users

### By Subject

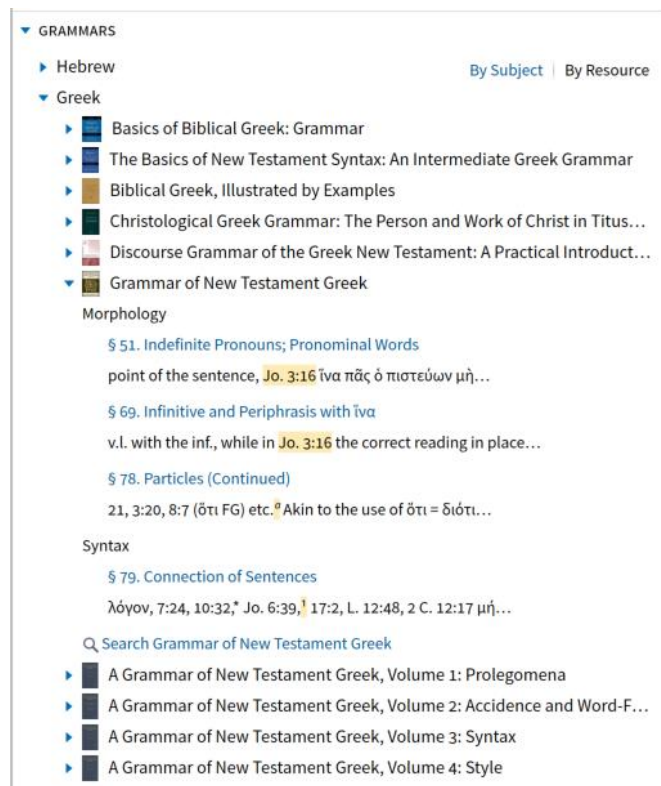
This view provides a list of subjects, with resources grouped beneath the subject listings.



The subject list is leftmost. The resources are grouped as necessary. One resource with a *Prolegomena* reference is classed as “Hebrew” and includes a reference to John 3:16; the rest are classed as “Greek.” Context displays with the reference highlighted.

### By Resource

This view provides a list of resource groups, with classifications appearing within the resources listed.



In this view, the resources (grammars) are the primary view, with the categories listed on a by-resource level. This allows all the hits within a single resource to be aggregated.

Further, it is possible to filter down to resource collections that include grammar resources. In this way, particular resource collections can be targeted for evaluation.

## Step 6: Updating and Keeping Current

Faithlife is continually releasing new resources for Logos Bible Software. Because this particular approach aggregates information from grammar resources for display and use elsewhere, it will need to be updated.

At present, the process to update the resources is automatic, though requires some manual intervention to complete. We hope to automate the process at regular intervals in the future.

## Conclusion and Future Directions

In this paper we've described how we've identified and grouped resources that discuss grammar of ancient languages and the Bible. We've discussed how we harvested Bible references from these resource and attempted classifying them through simple keyword based approaches and also using a method known as decision forests. And we've discussed how this information has been delivered to users of Logos Bible Software.

In the future, beyond simply updating the dataset when new grammar resources are published, we hope to provide more hierarchical categorization. That is, "Morphology" is a large category, and a majority of references are categorized this way. However, there are subcategories within "Morphology," such as

subcategories based on part of speech: noun, verb, conjunction, preposition, adjective, and the like. There are potentially other subcategories after that. A future task may be to take an article or a portion of an article classed as “Morphology” and determine an appropriate subcategory. This would be best applied to wide-ranging categories like “Morphology” and “Syntax.”

Also, we have other areas we would like to apply similar article/reference categorization to. One possible area would be Systematic Theology resources. We plan to explore this area in the future as well.



## Appendix: Grammar Resources and Their Groups

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### Group: Greek

- Basics of Biblical Greek: Grammar
- The Basics of New Testament Syntax: An Intermediate Greek Grammar
- Beginner's Grammar of the Greek New Testament
- Biblical Greek, Illustrated by Examples
- Biblical Greek: A Compact Guide
- A Brief Greek Syntax and Hints on Greek Accidence
- Christological Greek Grammar: The Person and Work of Christ in Colossians
- Christological Greek Grammar: The Person and Work of Christ in Ephesians
- Christological Greek Grammar: The Person and Work of Christ in Titus and Philippians
- Christological Greek Grammar: The Seven-Fold Work of Christ and His Finished Redemption in the New Covenant
- Discourse Grammar of the Greek New Testament: A Practical Introduction for Teaching and Exegesis
- The Elements of New Testament Greek
- Essentials of New Testament Greek
- From Alpha to Omega: A Beginning Course in Classical Greek
- From Alpha to Omega: Ancillary Exercises
- Fundamentals of New Testament Greek
- Grammar of New Testament Greek
- A Grammar of New Testament Greek, Volume 1: Prolegomena
- A Grammar of New Testament Greek, Volume 2: Accidence and Word-Formation
- A Grammar of New Testament Greek, Volume 3: Syntax
- A Grammar of New Testament Greek, Volume 4: Style
- Grammar of Septuagint Greek: Grammar
- A Grammar of the Greek New Testament in the Light of Historical Research
- A Grammar of the New Testament Greek
- A Grammar of the Old Testament in Greek: According to the Septuagint
- Grammatical Concepts 101 for Biblical Greek: Learning Biblical Greek Grammatical Concepts through English Grammar
- Greek for the Rest of Us: The Essentials of Biblical Greek, Second Edition
- Greek Grammar Beyond the Basics - Exegetical Syntax of the New Testament
- Greek Grammar beyond the Basics: An Exegetical Syntax of the New Testament
- A Greek Grammar for Colleges
- A Greek Grammar of the New Testament and Other Early Christian Literature
- Greek Grammar Rules: Drawn up for the Use of Harrow School
- Greek Is Good Grief: Laying the Foundation for Exegesis and Exposition
- Greek is Great Gain: A Method for Exegesis and Exposition
- Greek New Testament Insert
- The Greek Verb: Its Structure and Development

- The Handy Guide to New Testament Greek: Grammar, Syntax, and Diagramming
- Hellenika: A Beginning Greek Textbook Based on the Koine Greek of the New Testament
- Idioms of the Greek New Testament
- Intermediate New Testament Greek: A Linguistic and Exegetical Approach
- An Introduction to the Study of New Testament Greek
- An Introduction to the Study of New Testament Greek, Part One: Morphology, Volume 1: Lessons
- An Introduction to the Study of New Testament Greek, Part One: Morphology, Volume 2: Key, Lists, Paradigms, Indices
- It's Still Greek to Me: An Easy-to-Understand Guide to Intermediate Greek
- Johannine Grammar
- Johannine Vocabulary: A Comparison of the Words of the Fourth Gospel with Those of the Three
- Kairos: A Beginning Greek Grammar
- Learn to Read New Testament Greek
- Learning New Testament Greek Now and Then
- Learning the Basics of New Testament Greek
- List of Septuagint Words Sharing Common Elements: Supplement to Concordance or Dictionary
- The Morphology of Biblical Greek
- New Testament Greek Syntax: An Illustrated Manual
- New Testament Greek: A Beginning and Intermediate Grammar
- New Testament-Greek Notebook
- The Person and Work of Christ in the Greek of Romans: Part One (With a Brief Introduction of Greek Grammar)
- A Preparatory Grammar for New Testament Greek
- Prepositions and Theology in the Greek New Testament: An Essential Reference Resource for Exegesis
- A Primer of Biblical Greek
- A Short Grammar of the Greek New Testament, for Students Familiar with the Elements of Greek
- A Short Syntax of New Testament Greek
- Syntax of Classical Greek
- Syntax of the Moods and Tenses in New Testament Greek
- Syntax of the Moods and Tenses of the Greek Verb
- A Treatise on the Grammar of New Testament Greek: Regarded as a Sure Basis for New Testament Exegesis
- User-Friendly Greek: A Common Sense Approach to the Greek New Testament
- Vine's You Can Learn New Testament Greek!

## Group: Hebrew

- Basics of Biblical Hebrew: Grammar
- Beginning Biblical Hebrew
- Biblical Hebrew for Beginners

- Biblical Hebrew Grammar Visualized
- A Biblical Hebrew Reference Grammar
- Biblical Hebrew Step by Step, Volume 1
- Biblical Hebrew Step by Step, Volume 2: Reading from the Book of Genesis
- Biblical Hebrew: A Compact Guide
- Davidson's Introductory Hebrew Grammar
- Gesenius' Hebrew Grammar, 2nd English Edition
- A Grammar of Biblical Hebrew
- A Grammar of Biblical Hebrew: Revised English Edition
- Grammatical Concepts 101 for Biblical Hebrew
- Hebrew Bible Insert: A Student's Guide to the Syntax of Biblical Hebrew
- Hebrew for Reading Comprehension
- Hebrew for the Rest of Us: Using Hebrew Tools without Mastering Biblical Hebrew
- Hebrew Syntax (Third Edition)
- Introducing Biblical Hebrew
- An Introduction to Biblical Hebrew Syntax
- Key to Biblical Hebrew Step by Step, Volume 2
- Learning Biblical Hebrew: A New Approach Using Discourse Analysis
- Learning to Read Biblical Hebrew: An Introductory Grammar
- Linguistic Analysis of Biblical Hebrew
- Linguistics and Biblical Hebrew
- The Person and Work of Christ in the Hebrew Scriptures: Great Day of Atonement
- The Person and Work of Christ in the Hebrew Scriptures: Job, Isaiah and Ezekiel
- The Person and Work of Christ in the Hebrew Scriptures: Major Covenants
- The Person and Work of Christ in the Hebrew Scriptures: Psalms
- The Person and Work of Christ in the Hebrew Scriptures: The Festivals and Prayers
- The Person and Work of Christ in the Hebrew Scriptures: The Minor Prophets
- The Person and Work of Christ Jesus through Hebrew and Aramaic Grammar in the Torah, the Prophets, and the Writings of the Hebrew Scriptures: A Study of the Life and Ministry of Jesus Christ (an Old Testament Emmaus Walk)
- Studies in Hebrew and Aramaic Orthography
- A Study of Creation: Genesis 1:1–2:3
- A Study of Exodus 12
- A Study of Genesis 22
- A Study of Isaiah 53
- A Study of Psalm 22
- Syntax of the Hebrew Language of the Old Testament
- A Treatise on the Use of the Tenses in Hebrew and Some Other Syntactical Questions
- The Verbless Clause in Biblical Hebrew
- The Vocabulary Guide to Biblical Hebrew

## **Group: Aramaic**

- Basics of Biblical Aramaic: Complete Grammar, Lexicon, and Annotated Text
- Christological Aramaic Grammar: A Meditation and Worship on the Person and Work of Jesus Christ: A Brief Introductory Aramaic Grammar and Daniel 2 & 7
- An Introduction to Aramaic, Second Edition
- A Short Grammar of Biblical Aramaic

## **Group: Syriac**

- Compendious Syriac Grammar
- Syriac Grammar with Bibliography, Chrestomathy and Glossary

## **Group: Ugaritic**

- Basics of Ancient Ugaritic: A Concise Grammar, Workbook, and Lexicon
- Ras Shamra Parallels: The Texts from Ugaritic and the Hebrew Bible, Volume 1
- Ras Shamra Parallels: The Texts from Ugaritic and the Hebrew Bible, Volume 2
- Ras Shamra Parallels: The Texts from Ugaritic and the Hebrew Bible, Volume 3
- Ugaritic Textbook (Revised Reprint)
- Ugaritic-Hebrew Philology

## **Group: Latin**

- By Roman Hands: Inscriptions and Graffiti for Students of Latin
- Gildersleeve's Latin Grammar
- A Grammar of the Vulgate
- An Introduction to Ecclesiastical Latin
- Introduction to Latin

## **Group: Akkadian**

- The Akkadian Verb and Its Semitic Background

## **Group: Hittite**

- A Grammar of the Hittite Language: Reference Grammar and Tutorial

## **Group: Old Babylonian**

- Most Probably: Epistemic Modality in Old Babylonian