

Subcategorizing Adjectives with Multiple Frames

Megan Gotowski and Kaitlyn Harrigan

1. Introduction

During the word learning process, children must map a phonological form to a meaning. In order to map form to meaning, it has been argued that children rely on distributional information in a process that is known as syntactic bootstrapping (Landau & Gleitman 1985; Gleitman 1990). The claim is that children are able to use the frame—the syntactic environment in which a word is found—to narrow down the hypothesis space of possible meanings. For example, given the frame in (1), a learner is able to deduce that the novel verb is transitive; thus, *gorp* here could mean *hit* or *throw*, but not *sleep*. The converse is true for the frame in (2).

- (1) He gorps the ball.
- (2) He gorps.

Syntactic bootstrapping depends on two assumptions: (i) there are principled links between structure and meaning, and (ii) children are sensitive to those links. Indeed, there has been a large literature indicating that young children are able to use syntactic bootstrapping to learn verbs (see Naigles 1990; Gleitman et al. 2005; Papafragou et al. 2007; Yuan & Fisher 2009; Harrigan et al. 2019; among others) and nouns (see Brown 1973; Katz et al. 1974; among others). However, there has been considerably less attention given to how children learn adjectives—despite the fact that children of course need to acquire all sorts of grammatical categories in order to have a fully developed lexicon. From the research that has been done, we know that children are able to pay attention to various semantic properties in a frame to identify particular types of adjectives, such as adverbial modification (Syrett 2007; Syrett & Lidz 2010) and (in)animacy of the subject (Becker 2009).

Building off all of these earlier findings, more recent research has probed if learners are able to make fine-grained distinctions within a class of adjectives given syntactic information. Gotowski & Syrett (2024) investigated subjective adjectives—those that are judge-dependent (such as *fun* or *delicious*). Although all subjective adjectives share the property of exhibiting faultless disagreement (Stojanovic 2007; Anand 2009; Pearson 2013; among others)—being evaluated relative to a judge—there are distinct subclasses that are distinguished in terms of a unique distributional profile. Using the Human Simulation Paradigm (HSP;

* Megan Gotowski, William & Mary, mkgotowski@wm.edu, Kaitlyn Harrigan, William & Mary, kharrigan@wm.edu.

Gilette et al. 2005), Gotowski & Syrett found that adults are able to subcategorize novel adjectives as belonging to different subclasses given a set of frames—suggesting syntactic bootstrapping is a viable strategy in the adjectival domain. However, it has yet to be determined if children recruit these same syntactic frames during the word learning process. We thus extend the prior research with syntactic bootstrapping in the adjectival domain to children between 7-9 years of age using the same experimental paradigm.

2. Defining Subjective Adjectives

Here we focus on 5 different subcategories of subjective adjectives, and we refer to them in terms of a canonical member of each class, following Gotowski (2022): TOUGH, SMART, PRETTY, TALL, and TASTY. As mentioned, these adjectives are evaluated relative to a judge. For this reason, it is possible for Speaker A and B to disagree in (3) without any contradiction arising, giving rise to faultless disagreement; compare (3) to (4), the latter featuring a non-subjective adjective.

- (3) A: This one is {tough/smart/pretty/tall/tasty} !
 B: No, it is not!
- (4) A: This one is wooden!
 B: #No, it is not wooden!

Nevertheless, the adjectives in (3) display different behavior when their compatibility in various frames is considered. For example, while an adjective like *tough*, *smart* or *pretty* is possible in the frame in (5), only *tough* is possible in (6), and neither *tall* nor *tasty* is possible in either frame.

- (5) This one is {tough / smart / pretty / *tall / *tasty} to have.
 (6) It is {tough / *smart / *pretty / *tall / *tasty} for us to have this one.

In the following subsections, we provide a brief overview of the distributional signatures that are associated with the subjective adjective classes of interest. See Gotowski & Syrett (2024) and Gotowski (2025) for more details on the syntax and semantics associated with all five subjective adjective subclasses.

2.1. Tough-Class

Here we focus on the distributional signatures of these subcategories, with an emphasis on the syntactic information that signals their membership. The TOUGH-class is defined by the classic *tough*-alternation, in which the subject is either the object of the embedded clause (7a) or an expletive (7b); this alternation is possible because the adjective describes the event of the lower clause, and not an individual (see Lasnik & Fiengo 1974; Pesetsky 1987; among many others). In both (7a-b), the experiencer argument may be expressed with a *for*-phrase; this argument has also been analyzed as being co-indexed with the overt judge (Bylinina 2014).

- (7) a. This book is tough (for us) to read.
b. It is tough (for us) to read this book.

2.2. Smart-Class

The SMART-class is superficially similar to the TOUGH-class, but the former captures adjectives that participate in evaluative control (Stowell 1991; Kertz 2010). That is, the adjective describes a property of an individual (the subject NP) relative to an event corresponding to the lower clause; there is no implicature between (8a) and (8b). These same adjectives may surface with or without a non-finite clause, however. Note that a similar alternation is also possible with these adjectives (9)—but unlike with the *tough*-alternation, the subject of the matrix clause in (9a) is not interpreted as the object of the lower clause. The judge in this case typically surfaces in an *of*-phrase (as in 9b).

- (8) a. Alex is smart to take an earlier flight.
b. Alex is smart.
- (9) a. Joe is kind to invite him.
b. It is kind (of Joe) to invite him.

2.3. Pretty-Class

The PRETTY-class diverges from the previous two in that no such alternation is possible. These adjectives denote properties of individuals. Interestingly, these adjectives are still compatible with a non-finite clause (10). The subject of the matrix clause seems to be interpreted as the object of the lower clause when there is one, yet expletive subjects are not possible (Hicks 2009).

- (10) a. This dress would be pretty to wear to the reception tonight.
b. #It would be pretty to wear this dress to the reception tonight.

2.4. Tall-Class

Next, the TALL-class consists of adjectives that are dimensional terms and are only subjective in their positive forms—this is because, unlike the other classes, the subjectivity concerns the threshold (e.g. what “counts” as tall vs. not tall), and not the relative ordering of objects on a scale. In other words, if A is 6 feet tall and B is 5 feet 10 inches, speakers cannot (faultlessly) disagree as to who is taller, but they can felicitously disagree as to whether A or B is considered tall. Crucially, subjectivity also disappears when a measure phrase (MP) is included, and only TALL-class adjectives are compatible with such phrases (11).

- (11) The course is 26.2 miles long.

These adjectives only describe individuals, not events, and as such are not found with expletive subjects or non-finite clauses. It is not possible to express the judge for these adjectives with a *for*-phrase (contra the TOUGH-class) (12a); the judge, however, may be expressed via other means (12b) (Bylinina 2014). While *for*-phrases do surface with these adjectives, these are to express a comparison class as a standard (13).

- (12) a. #Pierre is tall for me.
b. I think Pierre is tall.
- (13) Pierre is tall for a third-grader.

2.5. Tasty-Class

Lastly, the TASTY-class refers to all other predicates of personal taste (PPTs) (see Lasersohn 2005). These subjective adjectives also describe individuals, but unlike the TALL-class, there is scalar variation (see 14). In contrast with the TALL-class, these adjectives are compatible with an overt judge-phrase, such as a e.g. *to*-NP phrase (15).

- (14) A: This cake is more delicious than that pie!
B: No, that pie is more delicious than this cake!
- (15) Seafood tastes delicious to me!

This class of adjectives is otherwise mostly defined by their inability to surface in particular frames, e.g., they are incompatible with expletives, non-finite clauses, and measure phrases.

2.6. The Learning Puzzle

From the learner, subjective adjectives pose a potential challenge. All of these adjectives share certain syntactic environments. They are all found in pre-nominal and predicative position. Individual classes also overlap in terms of the frames that they surface in. For example, adjectives in the TOUGH-, SMART-, and TASTY-class are found with non-finite clauses, and both the TOUGH-class and SMART-class are found with expletive subjects. Nevertheless, none of these classes share the same exact distributional signature (see Table 1).

Table 1. Distributional Signatures for Subjective Adjectives

Class	Modifies...		Non-Finite Clause	Expletive	MP	For/Of-Phrase Standard
	NPs	Events				
Tough		✓	✓	✓		✓
Smart	✓	✓*	✓	✓		✓
Pretty	✓		✓			
Tall	✓				✓	✓
Tasty	✓					

**modifies an individual with respect to an event*

The advantage of there being unique signatures is that if learners are able to track an adjective *across* frames, then they might be able to figure out how an adjective behaves and appropriately subcategorize.

There is evidence that children recruit multiple frames to subcategorize verbs (Mintz 2002, 2003), and the input to the child contains subjective adjectives in all types of frames mentioned here (Gotowski 2025). As a first step in assessing the possibility that learners rely on multiple frames to learn adjectives, as with verbs, Gotowski & Syrett (2024) conducted a modified version of the HSP, providing adult participants with novel adjectives corresponding to each of the classes in a cluster of frames. Participants had to guess the meaning of the novel adjective after receiving all frames. They found that participants were highly successful in terms of recruiting the distributional cues, providing guesses consistent with the entire set of frames. We interpret this as an important proof of concept; not only are cues available to the learner, but learners are sensitive to these cues. Here we take these findings as a starting point and extend this research to include children.

3. Experiment

3.1. Participants

Participants were 16 children between 7;09-9;11 years (mean age = 9;00) and 30 English-speaking adult controls participated. Child participants were recruited from the William & Mary Child Language Lab database. We recruited children in this age range due to previous research illustrating that older children could participate in the HSP with this format (Piccin & Waxman 2007), thus facilitating a direct comparison with Gotowski & Syrett (2024). Adults were recruited online via Prolific, and received a small monetary reward (\$3) for their participation.

3.2. Design

The experiment followed the same experimental procedure as in Gotowski & Syrett (2024), and used the same materials. Participants were instructed that they would be learning new words. They would watch a series of four short video clips;

each clip featured a novel adjective (such as *daxy*) in a different frame. The frame was repeated within the same clip, meaning that participants received each of the four frames twice (see the example in (16) featuring the TALL-class frames). The video clips featured two women having a conversation in front of a non-descript background; no objects or other context clues were provided. All frames included nonce nouns /verbs to avoid influencing participants with semantic information.

- (16) A: This greeb is very gloopy for a greeb.
 B: Yes! This greeb is very gloopy for a greeb.
 A: This is such a gloopy greeb!
 B: I agree. This is such a gloopy greeb.
 A: You know what, this greeb is three feet gloopy.
 B: Right, this greeb is three feet gloopy!
 A: Actually, this greeb may be too gloopy for a greeb.
 B: I agree. This greeb may be too gloopy for a greeb.

After participants watched all of the video clips, and thus received all frames, they were prompted to provide a guess (in the form of a single English word) as to the meaning of the target novel word. We did not provide participants with any additional information (e.g., grammatical category). The study was implemented via Qualtrics; adult participants typed their responses in directly, whereas parents were instructed to type in responses from their child. Unlike in Gotowski & Syrett (2024), this study was not timed—this was to ease the task demands for the child participants.

Each participant learned five target items, one for each of the five subcategories of interest, and one training item featuring a novel verb. All of the frames included cues indicating that the novel word was a (gradable) adjective, such as adverbial modification (*very, really, so*) and morphosyntactic information (all nonce target words ended in *-y*, e.g. *daxy, gloopy, wilpy*). Each set of frames also featured cues that were specific to one of the subclasses. However, note that participants were only given grammatical sentences—this means that they did not receive negative evidence, or information about frames in which the adjective would not be found. For this reason, the clusters of frames ranged in their informativity and restrictiveness, with the TOUGH, SMART, and TALL classes being the most restrictive, and the TASTY and PRETTY classes being the least restrictive.

3.3. Coding

We coded responses for (i) grammatical category and (ii) frame compliance. With respect to (i), we were primarily interested in whether participants provided adjectives or if they provided responses belonging to other grammatical categories (e.g., nouns, verbs). The expectation was that participants would provide adjectives, given previous research indicating that children are able to distinguish between grammatical categories (see e.g. Waxman & Booth 2001). For (ii), we looked to see if participants provided adjectives that “fit” the entire cluster of

frames. In other words, it is possible for a participant to guess an adjective without guessing a frame compliant response; however, all frame compliant responses are adjectives. Note that we were not assessing if participants provided a *specific* adjective—any response that was grammatical in all four frames was considered compliant. Adults in Gotowski & Syrett (2024) provided high rates of frame compliant responses, we therefore predicted that the adults in our study would perform similarly. It is an open question, however, as to whether children are able to reliably subcategorize.

3.4. Results

We first turn to the results from the adult controls. As predicted, the adults in this study largely patten exactly like those in Gotowski & Syrett (2024). Fig. 1 displays the rates of adjective responses (in black) and frame compliant responses (in gray). Overall, the adults provided almost exclusively adjectives, and frame compliant responses across-the-board.

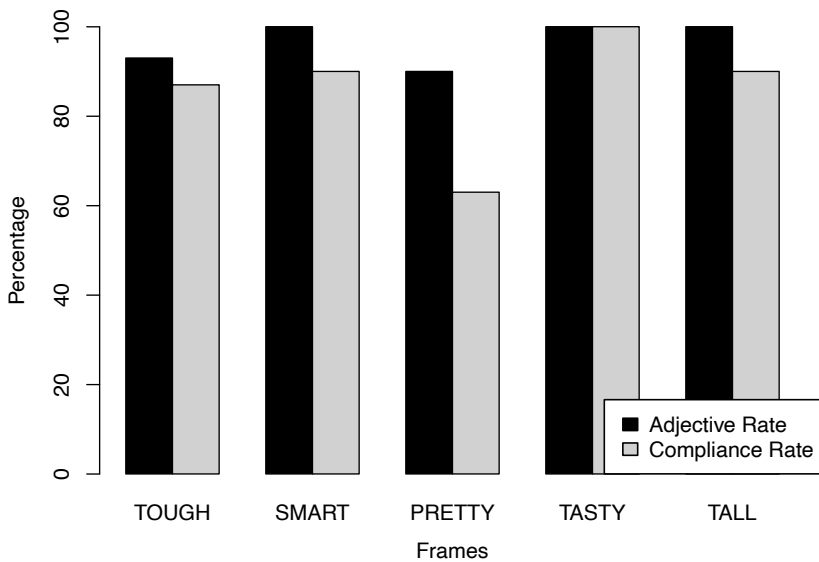


Figure 1. Rates of Adjective Response and Frame Compliance (Adults)

We next analyzed the results from the child participants. As demonstrated in Fig. 2 below, the children behave almost identically to the adult controls. They offered overwhelmingly adjective responses and also consistently provided frame compliant guesses for the nonce adjectives. Children’s performance matched adult behavior across all target items (sets of frames).

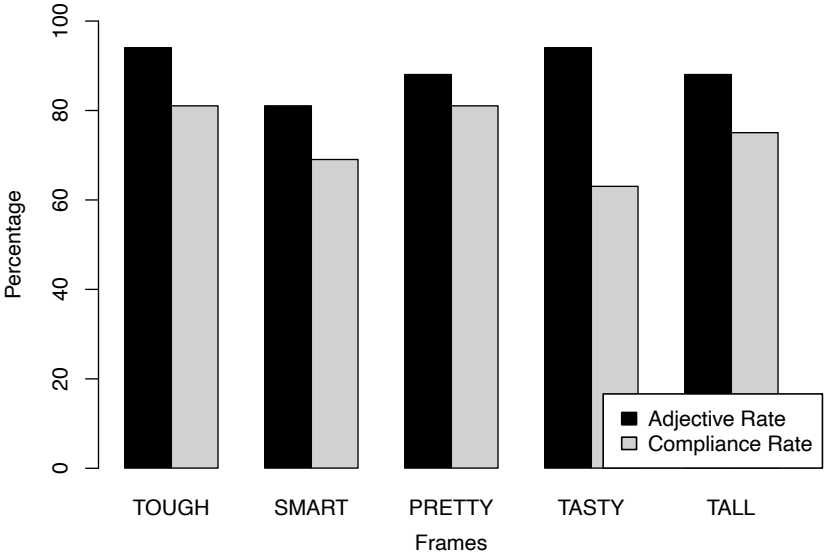


Figure 2. Rates of Adjective Response and Frame Compliance (Children)

We compared the child performance to that of the adult controls via a mixed effects logistic regression model in R (R core team 2021), treating compliance as a binary measure (0 for non-compliant, 1 for compliant) with population (with 2 levels: child and adult) and class (with 5 levels for adjective type) as fixed effects, and a random intercept for participant. There is no significant effect of population ($\beta = -0.88, p = 0.07$). This indicates that 7–9-year-old children are sensitive to the same surface-level distributional cues as adults.

Taking a closer look at the types of responses that children provided, we also find a range of adjectives, and not simply those that are most frequently attested in child-directed speech (CDS); the most frequently attested adjectives in CDS are dimensional adjectives, such as *big* and *little* (Gotowski 2025). These are only possible in TALL-class frames, and indeed children only offer adjectives of this type in these frames. Moreover, some of the adjectives that children offer—such as *rare* for TOUGH-class frames—are infrequent, as confirmed via CHILDES. The errors that children make are also revealing. For example, one of the children had guessed ‘length’ for the TALL-class, presumably noticing that the nonce word is a dimensional term associated with a scale, despite not providing an adjective. Unlike our adult participants, children also occasionally responded that they ‘did not know’ or ‘were not sure’—failing to provide an actual response. While these are coded as non-compliant responses, there is arguably a difference between one that is ungrammatical and one that may reflect potential difficulties accessing their lexicon—however, this is of course an open question.

4. Conclusion

These results indicate that syntactic bootstrapping is a viable word learning strategy for the adjectival domain. Children are able to track an adjective across a set of frames in order to appropriately subcategorize by at least 7 years of age. This indicates that they have a sensitivity to distributional cues and recruit those cues for learning. Of course, it is yet to be determined just how early this ability develops—although children produce lots of nouns and some verbs in their early lexicons (Frank et al. 2017), adjectives are somewhat delayed comparatively, with the earliest adjectives belonging to a small set that includes e.g., size-terms and colors, but not all of the classes of interest here (see Blackwell 2005; Tribushinina et al. 2014). For this reason, it could be the case that children are at least initially better at recruiting syntax for learning nouns and verbs before they are able to do so for learning adjectives. In ongoing research, we are extending this study to include even younger children to address this point. Nevertheless, the results here provide an important initial step in assessing the influence of syntax and add to a rich literature illustrating that children have early expectations about how syntax and semantics are linked in their grammar.

References

- Anand, Pranav. 2009. Kinds of taste. Santa Cruz, CA: University of California–Santa Cruz thesis.
- Becker, Misha. 2009. The role of NP animacy and expletives in verb learning. *Language Acquisition* 16(4). 283–296.
- Blackwell, Aleka A. 2005. Acquiring the English adjective lexicon: Relationships with input properties and adjectival semantic typology. *Journal of Child Language* 32(3). 535–562.
- Brown, Roger. 1973. A first language: The early stages. Cambridge, MA: Harvard University Press.
- Bylinina, Lisa. 2014. The grammar of standards: Judge-dependence, purpose-relativity, and comparison classes in degree constructions. Utrecht: Netherlands Graduate School of Linguistics dissertation.
- Frank, Michael. C., Mika Braginsky, Daniel Yurovsky, & Virginia A. Marchman. 2017. Wordbank: An open repository for developmental vocabulary data. *Journal of Child Language* 44(3).
- Gillette, Jane, Gleitman, Henry, Gleitman, Lila R., & Lederer, Anne. 1999. Human simulations of vocabulary learning. *Cognition* 73. 135–176.
- Gleitman, Lila R. 1990. The structural sources of verb meanings. *Language Acquisition: A Journal of Developmental Linguistics* 1. 3–55.
- Gleitman, Lila R., Kimberly Cassidy, Rebecca Nappa, Anna Papafragou, & John C. Trueswell. 2005. Hard words. *Language Learning and Development* 1. 23–64.
- Gotowski, Megan. 2022. Syntactic bootstrapping in the adjectival domain: learning subjective adjectives. New Brunswick, NJ: Rutgers University-School of Graduate Studies dissertation.
- Gotowski, Megan. 2025. Adjectival subcategorization in child-directed speech. *Language Acquisition*, 1–22. <https://doi.org/10.1080/10489223.2025.2524593>

- Gotowski, Megan & Kristen Syrett. 2024. Using surface structure to acquire subjective adjective meanings. *Language Acquisition*, 1–30.
- Harrigan, Kaitlyn, Valentine Hacquard, & Jeffrey Lidz. 2019. Hope for syntactic bootstrapping. *Language* 95(4), 642–682. <https://dx.doi.org/10.1353/lan.2019.0069>.
- Hicks, Glyn. 2009. Tough-constructions and their derivation. *Linguistic Inquiry* 40(4), 535–566.
- Katz, Nancy, Erica Baker, & John Macnamara. 1974. What's in a Name? A Study of How Children Learn Common and Proper Names. *Child Development* 45(2), 469–473. <https://doi.org/10.2307/1127970>
- Kertz, Laura. 2010. The argument structure of evaluative adjectives: A case of pseudo-raising. In M. Polinsky and N. Hornstein (eds.), *Movement theory of control*, 269–297. Philadelphia: John Benjamins.
- Landau, Barbara & Lila Gleitman 1985. *Language and experience: Evidence from the blind child*. Cambridge, MA: Harvard University Press.
- Lasnik, Peter. 2005. Context dependence, disagreement, and predicates of personal taste. *Linguistics and Philosophy* 28.6. 643–686.
- Lasnik, Howard & Robert Fiengo. 1974. Complement object deletion. *Linguistic Inquiry* 5(4). 535–571.
- Mintz, Toben H. 2002. Category induction from distributional cues in an artificial language. *Memory and Cognition* 30. 678–686.
- Mintz, Toben H. 2003. Frequent frames as a cue for grammatical categories in child directed speech. *Cognition* 90(1). 91–117.
- Naigles, Letitia G. 1990. Children use syntax to learn verb meanings. *Journal of Child Language* 17. 357–374.
- Papafragou, Anna, Kimberly Cassidy, & Lila Gleitman. 2007. When we think about thinking: The acquisition of belief verbs. *Cognition* 105(1). 125–165.
- Pearson, Hazel. 2013. A judge-free semantics for predicates of personal taste. *Journal of Semantics* 30(1). 103–154.
- Pesetsky, David. 1987. Binding problems with experiencer verbs. *Linguistic Inquiry* 18(1). 203–238.
- Piccin, Thomas & Waxman, Sandra. 2007. Why Nouns Trump Verbs in Word Learning: New Evidence from Children and Adults in the Human Simulation Paradigm. *Language Learning and Development* 3. 295–323. 10.1080/15475440701377535.
- R Core Team. 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
- Stojanovic, Isidora. 2007. Talking about taste: Disagreement, implicit arguments, and relative truth. *Linguistics and Philosophy* 30(6). 691–706.
- Stowell, Timothy. 1991. The alignment of arguments in adjective phrases. In S. Rothstein (ed.), *Perspectives on phrase structure: Heads and licensing*, 105–135. Amsterdam: Brill.
- Syrett, Kristen. 2007. *Learning about the structure of scales: Adverbial modification and the acquisition of the semantics of gradable adjectives*. Evanston, IL: Northwestern University dissertation.
- Syrett, Kristen & Jeffrey Lidz. 2010. 30-month-olds use the distribution and meaning of adverbs to interpret novel adjectives. *Language Learning and Development* 6. 258–282.

- Tribushinina, Elena, Huub van den Bergh, Dorit Ravid, Ayhan Aksu-Koç, Mariane Kilani-Schoch, Katharina Korecky-Kröll, Iris Leibovitch-Cohen, Sabine Laaha, Bracha Nir, Wolfgang U. Dressler, & Steven Gillis. 2014. Development of adjective frequencies across semantic classes: A growth curve analysis of child speech and child-directed speech. *LIA Language, Interaction and Acquisition* 5(2). 185–226.
- Waxman, Sandra R. & Amy E. Booth. 2001. Seeing pink elephants: Fourteen-month-olds' interpretations of novel nouns and adjectives. *Cognitive Psychology* 43.3. 217–242.
- Yuan, Sylvia & Cynthia Fisher. 2009. “Really? She blicked the baby?” Two-year-olds learn combinatorial facts about verbs by listening. *Psychological Science* 20. 619–626.

Proceedings of the 50th annual Boston University Conference on Language Development

edited by Romi Hill, Xinhan Jiang,
Danutham Worapipat, and Aditya Yedetore

Cascadilla Press Somerville, MA 2026

Copyright information

Proceedings of the 50th annual Boston University Conference on Language Development
© 2026 Cascadilla Press. All rights reserved

Copyright notices are located at the bottom of the first page of each paper.
Reprints for course packs can be authorized by Cascadilla Press.

ISSN 1080-692X
ISBN 978-1-57473-047-0 (2 volume set, paperback)

Ordering information

To order a copy of the proceedings or to place a standing order, contact:

Cascadilla Press, P.O. Box 440355, Somerville, MA 02144, USA
phone: 1-617-776-2370, sales@cascadilla.com, www.cascadilla.com