

Contact Information

Department of Linguistics
Stony Brook University
Stony Brook, NY 11794-4376
USA

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http://thomasgraf.net

Research Interests

- Mathematical Linguistics
 - Subregularity in phonology, morphology, and syntax
 - Minimalist grammars
 - Model-theoretic syntax
- Parsing theory & syntactic processing
- Generative Syntax
 - Binding
 - Economy, Locality and Encoding of Constraints
 - Island constraints
 - Morphosyntax

Academic Employment and Affiliations

2013–present	Assistant Professor Department of Linguistics, Stony Brook University
2015–present	Affiliate Professor Institute for Advanced Computational Science (IACS), Stony Brook University

Education

2010–2013	University of California, Los Angeles Ph.D. in Linguistics <ul style="list-style-type: none">• Thesis: <i>Local and Transderivational Constraints in Syntax and Semantics</i>• Committee: Edward P. Stabler (chair), David Kaplan, Edward L. Keenan, Dominique Sportiche
2008–2010	University of California, Los Angeles M.A. in Linguistics <ul style="list-style-type: none">• Thesis: <i>Logics of Phonological Reasoning</i>• Committee: Edward P. Stabler (chair), Robert Daland, Edward L. Keenan, Kie Zuraw
2003–2007	University of Vienna Mag.phil. (\approx M.A.) in Linguistics

- Thesis: *From Vagueness to Disaster: On the Intricacies of Feature Checking*
- Committee: **Wolfgang U. Dressler** (chair), **Chris Schaner-Wolles**

Refereed Journal Papers

- [5] **2017**. The subregular complexity of monomorphemic quantifiers. Ms., Stony Brook University; submitted to *Semantics & Pragmatics*.
- [4] **2017**. A computational guide to the dichotomy of features and constraints. *Glossa* 2. 1–36. <https://doi.org/10.5334/gjgl.212>.
- [3] **2017**. The power of locality domains in phonology. *Phonology* 34. in press, 1–21. <https://doi.org/10.1017/S0952675717000197>.
- [2] **2017** (with James Monette and Chong Zhang). Relative clauses as a benchmark for Minimalist parsing. *Journal of Language Modelling* 5. 57–106. <https://doi.org/10.15398/jlm.v5i1.157>.
- [1] **2007**. Agreement with hybrid nouns in Icelandic. *Snippets* 16. Available at: <http://www.ledonline.it/snippets/>, 7–8.

Refereed Book Chapters

- [2] **2012**. Concealed reference-set computation: how syntax escapes the parser's clutches. In Anna Maria Di Sciullo (ed.), *Towards a biolinguistic understanding of grammar. Essays on interfaces*, 339–362. Amsterdam: John Benjamins.
- [1] **2010**. Formal parameters of phonology: from Government Phonology to SPE. In Thomas Icard & Reinhard Muskens (eds.), *Interfaces: explorations in logic, language and computation*, vol. 6211 (Lectures Notes in Artificial Intelligence), 72–86. Berlin: Springer.

Paper-Reviewed Proceedings Papers

- [15] **2017**. Grammar size and quantitative restrictions on movement. To appear in *Proceedings of SCiL 2018*.
- [14] **2017**. Graph transductions and typological gaps in morphological paradigms. In *Proceedings of the 15th meeting on the mathematics of language*, 114–126.
- [13] **2016** (with Alëna Aksënova and Sedigheh Moradi). Morphotactics as tier-based strictly local dependencies. In *Proceedings of the 14th sigmorphon workshop on computational research in phonetics, phonology, and morphology*, 121–130.
- [12] **2016** (with Alëna Aksënova and Aniello De Santo). A single movement normal form for Minimalist grammars. In Annie Foret, Glyn Morrill, Reinhard Muskens, Rainer Osswald & Sylvain Pogodalla (eds.), *Formal grammar : 20th and 21st international conferences, fg 2015, barcelona, spain, august 2015, revised selected papers. fg 2016, bozen, italy, august 2016*, 200–215. Berlin, Heidelberg: Springer. https://doi.org/10.1007/978-3-662-53042-9_12.
- [11] **2016** (with Aniello De Santo and Alëna Aksënova). An alternate view on strong lexicalization in TAG. In *Proceedings of the 12th international workshop on Tree Adjoining Grammars and related formalisms (TAG+12)*, 93–102. Düsseldorf, Germany.

- [10] **2015** (with Brigitta Fodor, James Monette, Gianpaul Rachiele, Aunika Warren and Chong Zhang). A refined notion of memory usage for minimalist parsing. In *Proceedings of the 14th meeting on the mathematics of language (mol 2015)*, 1–14. Chicago, USA: Association for Computational Linguistics.
- [9] **2014** (with Bradley Marcinek). Evaluating evaluation metrics for minimalist parsing. In *Proceedings of the 2014 ACL workshop on cognitive modeling and computational linguistics*, 28–36.
- [8] **2014**. Late merge as lowering movement in Minimalist grammars. In Nicholas Asher & Sergei Soloviev (eds.), *LACL 2014*, vol. 8535 (Lecture Notes in Computer Science), 107–121. Heidelberg: Springer. https://doi.org/10.1007/978-3-662-43742-1_9.
- [7] **2014**. Models of adjunction in Minimalist grammars. In Glynn Morrill, Reinhard Muskens, Rainer Osswald & Frank Richter (eds.), *Formal grammar 2014*, vol. 8612 (Lecture Notes in Computer Science), 52–68. Heidelberg: Springer. https://doi.org/10.1007/978-3-662-44121-3_4.
- [6] **2012**. Locality and the complexity of Minimalist derivation tree languages. In Philippe de Groot & Mark-Jan Nederhof (eds.), *Formal grammar 2010/2011*, vol. 7395 (Lecture Notes in Computer Science), 208–227. Heidelberg: Springer. https://doi.org/10.1007/978-3-642-32024-8_14.
- [5] **2012**. Movement-generalized Minimalist grammars. In Denis Béchet & Alexander J. Dikovsky (eds.), *LACL 2012*, vol. 7351 (Lecture Notes in Computer Science), 58–73. https://doi.org/10.1007/978-3-642-31262-5_4.
- [4] **2012**. Reference-set constraints as linear tree transductions via controlled optimality systems. In Philippe de Groote & Mark-Jan Nederhof (eds.), *Formal grammar 2010/2011*, vol. 7395 (Lecture Notes in Computer Science), 97–113. Heidelberg: Springer. https://doi.org/10.1007/978-3-642-32024-8_7.
- [3] **2011**. Closure properties of Minimalist derivation tree languages. In Sylvain Pogodalla & Jean-Philippe Prost (eds.), *LACL 2011*, vol. 6736 (Lecture Notes in Artificial Intelligence), 96–111. Heidelberg: Springer. https://doi.org/10.1007/978-3-642-22221-4_7.
- [2] **2010**. Some interdefinability results for syntactic constraint classes. In Christian Ebert, Gerhard Jäger & Jens Michaelis (eds.), *The mathematics of language*, vol. 6149 (Lecture Notes in Computer Science), 72–87. Heidelberg: Springer.
- [1] **2009**. Towards a factorization of string-based phonology. In Thomas Icard (ed.), *Proceedings of the 14th student session of the european summerschool for logic, language and information*, 72–84.

Abstract-Reviewed Proceedings Papers

- [5] **2014**. Feature geometry and the Person Case Constraint: an algebraic link. In *Proceedings of CLS 50*. To appear.
- [4] **2013**. The syntactic algebra of adjuncts. In *Proceedings of CLS 49*. To appear.

- [3] **2012.** Tree adjunction as Minimalist lowering. In *Proceedings of the 11th international workshop on tree adjoining grammars and related formalisms (tag+11)*, 19–27.
- [2] **2012** (with Natasha Abner). Is syntactic binding rational? In *Proceedings of the 11th international workshop on Tree Adjoining Grammars and related formalisms (TAG+11)*, 189–197.
- [1] **2010.** Comparing incomparable frameworks: a model theoretic approach to phonology. *University of Pennsylvania Working Papers in Linguistics* 16(2). Article 10.

Non-Refereed Publications

- [5] **2014.** Beyond the apparent: cognitive parallels between syntax and phonology. In Carson T. Schütze & Linnaea Stockall (eds.), *Connectedness: papers by and for sarah van wagenen*, vol. 18 (UCLA Working Papers in Linguistics), 161–174.
- [4] **2012.** An algebraic perspective on the Person Case Constraint. In Thomas Graf, Denis Paperno, Anna Szabolcsi & Jos Tellings (eds.), *Theories of everything. In honor of Ed Keenan*, vol. 17 (UCLA Working Papers in Linguistics), 85–90.
- [3] **2010.** A tree transducer model of reference-set computation. *UCLA Working Papers in Linguistics* 15, Article 4. 1–53.
- [2] **2010.** *Logics of phonological reasoning*. University of California, Los Angeles MA thesis.
- [1] **2007.** *From vagueness to disaster: on the intricacies of feature checking*. University of Vienna MA thesis.

Edited Publications

- [2] **2012** (with Denis Paperno, Anna Szabolcsi and Jos Tellings), eds. *Theories of Everything. In Honor of Ed Keenan*. Vol. 17. (UCLA Working Papers in Linguistics).
- [1] **2010**, ed. *Papers in Mathematical Linguistics 1*. Vol. 15. (UCLA Working Papers in Linguistics).

Invited Talks

- [20] **2017.** *tbd.* Invited talk, December 15, Rutgers University, New Brunswick, NJ.
- [19] **2017.** *Do We Need Features for Morphosyntax?* Invited talk, June 26, Workshop on Morphomathematics, Leibniz-Zentrum für Allgemeine Sprachwissenschaft, Berlin, Germany.
- [18] **2017.** *It's a (Sub-)Regular Conspiracy: Locality and Computation in Phonology, Morphology, Syntax, and Semantics.* Invited talk, May 25–27, CLS, University of Chicago, Chicago, IL.
- [17] **2017.** *Fragments of First-order Logic for Linguistic Structures.* Invited talk, April 21, UConn Logic Group, University of Connecticut, Storrs, CT.
- [16] **2016.** *Computational Parallels Across Language Modules.* Invited talk, September 12, Department of Linguistics, Yale University, New Haven, CT.
- [15] **2016.** *Computational Lessons from and for Language.* Invited talk, April 28, IACS, Stony Brook University, Stony Brook, NY.

- [14] **2015.** *Towards an Algebraic Morphosyntax*. Invited talk, December 16, Department of Theoretical and Applied Linguistics, Moscow State University, Moscow, Russia.
- [13] **2015.** *Computational Unity Across Language Modules*. Invited talk, December 15, Department of Theoretical and Applied Linguistics, Moscow State University, Moscow, Russia.
- [12] **2015.** *Adjuncts, Conjuncts, Ojuncts: Deriving Strong Island Constraints*. Invited talk, Institute of Linguistics, Russian State University for the Humanities (RGGU), Moscow, Russia.
- [11] **2015.** *Syntax and Phonology: A Computational Common Core*. Department of Mathematical Linguistics, Saint Petersburg State University, St. Petersburg, Russia.
- [10] **2015.** *Formal Processing Theory, or Parsing Without Parsers*. Slides of a talk given at the Workshop on Minimalist Parsing, October 9–12, MIT, Boston, MA.
- [9] **2014.** *Adjuncts, Islands, Algebra (With a Sprinkling of Semantics)*. Invited talk, November 4, CUNY Graduate Center, New York, NY.
- [8] **2014.** *Person Case Constraints and Feature Complexity in Syntax*. Invited talk, January 9, Institut für Sprachwissenschaft, Universität Wien, Vienna, Austria.
- [7] **2013.** *Computational Computational Linguistics*. Invited talk, December 4, Department of Psychology, Stony Brook University, Stony Brook, NY.
- [6] **2013.** *Optionality Implies Islandhood*. Invited talk, November 1, Department of Linguistics, NYU, New York, NY.
- [5] **2013.** *Islands Without Islands*. Invited talk, October 4, Department of Linguistics and Cognitive Science, University of Delaware, Newark, DE.
- [4] **2013.** *Constraints Emerge from Merge*. Invited talk, February 12, Department of Linguistics, Stony Brook University, Stony Brook, NY.
- [3] **2010.** *Syntax, Semantics, Pragmatics: Where do we Find Optimality?* Invited talk, December 15, Institut für Anglistik, Universität Göttingen, Göttingen, Germany.
- [2] **2010.** *Optimality Conditions Could Care Less About Optimality*. Invited talk, December 10, Zentrum für Allgemeine Sprachwissenschaft (ZAS), Berlin, Germany.
- [1] **2010.** *Reference-Set Computation = Minimalism + Transformational Rules?*. Invited talk, December 8, Institut für Linguistik, Universität Bielefeld, Bielefeld, Germany.

Other Talks & Posters

- [40] **2017.** *Grammar Size and Quantitative Restrictions on Movement*. Slides of a talk given at SCiL 2018, January 04-07, Utah.
- [39] **2017.** *Locality Domains and Phonological C-Command Over Strings*. Slides of a talk given at the 48th Annual Meeting of the North East Linguistic Society (NELS 48), October 27–29, University of Iceland, Reykjavík, Iceland.
- [38] **2017.** *Syntax in Phonology? C-Command Over Strings*. Slides of a talk given at NECPhon 2017, Oct 21, Stony Brook University, Stony Brook, NY.

- [37] **2017** (with Aniello De Santo and John E. Drury). *Evaluating Subregular Distinctions in the Complexity of Generalized Quantifiers*. Poster presented at the ESSLI Workshop on Quantifiers and Determiners (QUAD 2017), July 17 – 21, University of Toulouse, France.
- [36] **2017**. *Graph Transductions and Typological Gaps in Morphological Paradigms*. Slides of a talk given at the 15th meeting on the Mathematics of Language (MOL 2017), July 13–14, Queen Mary University of London, London, UK.
- [35] **2016** (with Alëna Aksënova and Sedigheh Moradi). *Tier-Based Strict Locality in Phonology and Morphology*. Slides of a talk given at the 10th Northeast Computational Phonology Meeting (NECPhon), September 24, UMass Amherst, Amherst, MA.
- [34] **2016** (with Alëna Aksënova and Aniello De Santo). *A Single Movement Normal Form for Minimalist Grammars*. Slides of a talk given at the 21st Conference on Formal Grammar, August 20–21, Bolzano, Italy.
- [33] **2016** (with Alëna Aksënova and Sedigheh Moradi). *Morphotactics as Tier-Based Strictly Local Dependencies*. Slides of a talk given at the 14th SIGMORPHON Workshop on Computational Research in Phonetics, Phonology, and Morphology, August 11, Berlin, Germany.
- [32] **2016** (with Aniello De Santo and Alëna Aksënova). *An Alternate View on Strong Lexicalization in TAG*. Slides of a talk given at the 12th International Workshop on Tree Adjoining Grammars and Related Formalisms, June 29 – July 1, Düsseldorf, Germany.
- [31] **2015** (with Brigitta Fodor, James Monette, Gianpaul Rachiele, Aunika Warren and Chong Zhang). *A Refined Notion of Memory Usage for Minimalist Parsing*. Slides of a talk given at MOL14, July 25–26, University of Chicago, Chicago, IL.
- [30] **2015**. *A Hidden Consensus: Computational Invariants of Minimalist Syntax*. Poster presented at The Road Ahead, May 28–30, Athens, Greece.
- [29] **2015** (with Jeffrey Heinz). *Commonality in Disparity: The Computational View of Syntax and Phonology*. Slides of a talk given at GLOW 2015, April 18, Paris, France.
- [28] **2015**. *A Computational Guide to the Dichotomy of Features and Constraints*. Slides of a talk given at DGfS 2015, April 15–18, University of Leipzig, Leipzig, Germany.
- [27] **2014**. *Dependencies in Syntax and Phonology: A Computational Comparison*. Slides of a talk given at NECPHON 2014, November 15, NYU, New York, New York.
- [26] **2014**. *Models of Adjunction in Minimalist Grammars*. Slides of a talk given at FG2014, August 16–17, University of Tübingen, Tübingen, Germany.
- [25] **2014** (with Bradley Marcinek). *Evaluating Evaluation Metrics for Minimalist Parsing*. Slides for a talk given at Cognitive Modeling and Computational Linguistics (CMCL 2014), June 26, Baltimore, MD.
- [24] **2014**. *Late Merge as Lowering Movement in Minimalist Grammars*. Slides of a talk given at LACL 2014, June 18–20, IRIT, Toulouse, France.
- [23] **2014**. *Feature Geometry and the Person Case Constraint: An Algebraic Link*. Slides of a talk given at CLS 50, April 10–12, University of Chicago, Chicago, IL.

- [22] **2013.** *The Syntactic Algebra of Adjuncts*. Slides of a talk given at CLS 49, April 18–22, University of Chicago, Chicago, IL.
- [21] **2013.** *The Price of Freedom: Why Adjuncts are Islands*. Slides of a talk given at the Deutsche Gesellschaft für Sprachwissenschaft 2013, March 12–15, University of Potsdam, Potsdam, Germany.
- [20] **2013.** *Of Tops and Bottom: The Algebra of Person Case Constraints*. Slides of a talk given at the Southern California Students in Linguistics Conference 2013 (SCSiL 2013), January 18, University of Southern California, Los Angeles, CA.
- [19] **2012** (with Natasha Abner). *Is Syntactic Binding Rational?* Poster presented at the 11th International Workshop on Tree Adjoining Grammars and Related Formalisms (TAG+11), September 26–28, University Paris-Diderot, Paris, France.
- [18] **2012.** *Tree Adjunction as Minimalist Lowering*. Slides of a talk given at the 11th International Workshop on Tree Adjoining Grammars and Related Formalisms (TAG+11), September 26–28, University Paris-Diderot, Paris, France.
- [17] **2012.** *Movement-Generalized Minimalist Grammars*. Slides of a talk given at LACL 2012, July 2–4, LINA, Nantes, France.
- [16] **2012** (with Natasha Abner). *Binding Complexity and the Status of Pronouns in English and ASL*. Poster presented at Formal and Experimental Advances in Sign Language (FEAST), June 1–2, University of Warsaw, Warsaw, Poland.
- [15] **2012** (with Natasha Abner). *The Complexity of Binding in English and ASL*. Slides of a talk given at CLS 48, April 19–21, University of Chicago, Chicago, IL.
- [14] **2012.** *Why There Must be Exceptions to Principle B*. Poster presented at the 30th West Coast Conference on Formal Linguistics (WCCFL 30), April 13–15, UCSC, Santa Cruz, CA.
- [13] **2011.** *Locality and the Complexity of Minimalist Derivation Tree Languages*. Slides of a talk presented at the 16th Conference on Formal Grammar (FG-2011), August 6, 2011, Ljubljana, Slovenia.
- [12] **2011.** *Closure Properties of Minimalist Derivation Tree Languages*. Slides of a talk given at LACL 2011, June 29–July 1, LIRMM, Montpellier, France.
- [11] **2011.** *Optimality is not a Race: Against a Performance-based View of Reference-set Computation*. Slides of a talk given at Glow 34, April 28–30, 2011, University of Vienna, Vienna, Austria.
- [10] **2011.** *Lost in Translation: A Formal Model of Merge-over-Move and its Implications for the Language Faculty*. Slides of a talk given at ConSOLE XIX, January 5–8, 2011, University of Groningen, Groningen, Netherlands.
- [9] **2010.** *Efficient Computation at the Interfaces*. Poster presented at On Linguistic Interfaces II (OnLI II), December 2–4, 2010, University of Ulster, Belfast, United Kingdom.
- [8] **2010.** *Rethinking Transderivationality*. Slides of a talk given at the 41st annual meeting of the North East Linguistic Society (NELS 41), October 22–24, University of Pennsylvania, Philadelphia, PA.

- [7] **2010.** *Reference-Set Constraints as Linear Tree Transductions via Controlled Optimality Systems.* Slides of a talk presented at the 15th Conference on Formal Grammar (FG-2010), August 7–8, 2010, University of Copenhagen, Copenhagen, Denmark.
- [6] **2010.** *Concealed Reference-Set Computation or How Syntax Escapes the Parser’s Clutches.* Poster presented at The Language Design, May 27–29, UQAM, Montreal, Canada.
- [5] **2009.** *Locality in Flux — Reducibility Results for Syntactic Constraints.* Poster presented at the Conference on Minimalist Approaches to Syntactic Locality (MASL), August 26 – 28, Research Institute for Linguistics of the Hungarian Academy of Sciences, Budapest, Hungary.
- [4] **2009.** *Some Interdefinability Results for Syntactic Constraint Classes.* Slides of a talk given at the Eleventh Meeting on the Mathematics of Language (MOL11), August 20 – 21, Universität Bielefeld, Bielefeld, Germany.
- [3] **2009.** *Towards a Factorization of String-Based Phonology.* Slides of a talk given at the 14th ESSLLI Student Session, July 20 – 31, Université Bordeaux, Bordeaux, France.
- [2] **2009.** *Comparing Incomparable Frameworks — A Model Theoretic Approach to Phonology.* Handout of a talk given at the 33rd Penn Linguistics Colloquium (PCL33), March 27 – 29, University of Pennsylvania, Philadelphia, PA.
- [1] **2008.** *Ein modelltheoretischer Blick auf syntaktische Constraints.* Handout of a talk given at Generative Grammatik des Südens 2008 (GGs 08), May 2-4, ZAS Berlin, Germany.

Awards, Grants & Prizes

2015	Research Initiative Grant for Faculty in the Fine Arts, Humanities, and Lettered Social Sciences (FAHSS) Stony Brook University
2014	E.W. Beth Dissertation Prize for Outstanding Dissertations in Logic, Language, and Information Association for Logic, Language and Information
2010 & 2011	DOC-Fellowship of the Austrian Academy of Sciences Austrian Academy of Sciences (ÖAW)
2009	Springer Prize for Best Student Paper at ESSLLI2009 ESSLLI Student Session

Advising

Aksënova, Alëna	Stony Brook University, primary advisor, QP1 chair
De Santo, Aniello	Stony Brook University, primary advisor, QP1 chair
Laszakovits, Sabine	University of Connecticut, external QP committee member
Lee, So Young	Stony Brook University, QP2 chair
Monette, James	Stony Brook University, QP2 chair, QP1 committee member
Pasternak, Robert	Stony Brook University, QP2 chair, QP1 committee member
Payne, Amanda	University of Delaware, external Ph.D. committee member

Thompson, Bryan Stony Brook University, Honors Thesis committee member
 Vu, Mai Ha University of Delaware, external Ph.D. committee member
 Yang, Su Ji Stony Brook University, Honors Thesis chair
 Zhang, Chong Stony Brook University, Ph.D. thesis co-advisor

Teaching

Stony Brook Computational Linguistics 2 (graduate level)
 Computational Phonology (graduate level)
 Computational Syntax (graduate level)
 Mathematical Methods (graduate level)
 Language and Meaning (undergraduate level)
 Language and Technology (undergraduate level)
 Parsing and Syntactic Processing (graduate level)
 Syntax (undergraduate level)

Service

Reviewing

Paper Reviews in 20...	≤ 13	14	15	16	17	18
Biolinguistics			✓	✓		
Cambridge University Press	✓					
Cognitive Modelling & Computational Linguistics			✓	✓	✓	✓
ESSLI Student Session	✓					
Formal Grammar					✓	
Glossa					✓	
Italian Journal of Linguistics		✓				
Journal of Logic, Language, and Information					✓	
Journal of Language Modelling				✓		
Journal of Linguistics			✓			
Linguistic Inquiry	✓	✓				
Natural Language & Linguistic Theory	✓					
Phonology					✓	
Oxford University Press	✓		✓			
Syntax					✓	
TAG+					✓	

Abstract Reviews in 20...	≤ 13	14	15	16	17	18
AAAI-SSS					✓	
LabPhon				✓		
SCiL						✓
WCCFL		✓	✓		✓	
XPrag					✓	

2009–present Creator and current maintainer of the **timeline of the history of generative syntax**. Available online: <http://thomasgraf.net/timeline.html>

2009–2013 Creator of the *uclawpl* \LaTeX 2 ϵ class file used by the **UCLA Working Papers in Linguistics**

Department Service

Co-director of CompLab	since Fall 2013
M.A. CompLing Program Director	since Fall 2017
Program Development	M.A. program in Computational Linguistics initial draft of B.A. program in Computational Linguistics
Course Development	Language & Technology (Lin 120) Computational Linguistics 2 (Lin 637) Computational Syntax (Lin 628) Mathematical Methods (Lin 539) Parsing and Processing (Lin 630)
Colloquium Committee	2014–2017
Ph.D. Admissions Committee	2016, 2017
Strategic Plan Committee	2015
Student Travel Fund Committee	2016
Stony Brook Career Fair	2016

University Service

IACS Computes! HS Summer Camp	2017
Mathematics Summer Program	2016, 2017
Stony Brook Visit a Class Program	2016, 2017

Languages

Natural	in decreasing order of proficiency: German, English, French, Icelandic, Old Norse, Latin, Middle High German, Spanish
Formal	Bash, CSS, HTML, \LaTeX , Lua, OCaml, Prolog, Python, TikZ