Gilad Bracha

Curriculum Vitae

February 26, 2013

Executive Summary

- Software Engineer, Google.
- Co-designer of the Dart programming language.
- VP, Cloud Programming Model, SAP Labs
- Designer of the Newspeak programming language
- Distinguished Engineer at Cadence Design Systems
- Distinguished Engineer at Sun Microsystems
- Java Language architect and maintainer and co-author of the Java Language Specification.
- Co-maintainer and co-author of the Java Virtual Machine Specification.
- Member of the Animorphic Smalltalk team.
- Recognized authority on object-oriented language research and development. My research emphasizes quality rather than quantity. I don't publish a great deal, but what I publish matters, and is widely cited.
- Track record of bringing leading edge research results into practical industrial application.

Education

- Ph.D. Computer Science, 1991, University of Utah. Gary Lindstrom, advisor. Research area: Object Oriented Programming Languages. Dissertation title: *The Programming Language Jigsaw: Modularity, Mixins and Multiple Inheritance.*
- B.Sc. Mathematics and Computer Science, Ben-Gurion University, Israel, 1983.

Employment

- **July 2011 - present**. Software Engineer, Google.
  - **Responsibility:** Co-designer of the Dart programming language, responsible for the written language specification and design of reflective libraries.
- **June 2010 - July 2011**. Vice President, Cloud Programming Model, Office of CTO, SAP Labs.
- **January 2009 - May 2010**. Independent consultant.
- **October 2006 - January 2009.** Distinguished Engineer, Cadence Design Systems.
  - **Responsibility:** Design and Implementation of the Newspeak programming language and platform. I lead a team of developers implementing Newspeak, supporting an extended group of application developers using Newspeak within Cadence.
- **February 1997 - October 2006.** Computational Theologist, Java SE, Sun Microsystems.
  - Distinguished Engineer as of 2005.
  - **Responsibility:**
    - Java Language architect and maintainer of the Java Language Specification (JLS).
      - Ongoing work on extensions to the Java programming language. Chief among these was the addition of generic types. I have chaired or co-chaired several expert groups working on Java language extensions. Later work includes the introduction of a module system at the language level (JSR294) and its interaction with a platform modularity scheme (JSR277), as well as participation in an effort to introduce full closures into the Java programming language.

        - Co-authored JLS 3rd edition, which covers the new language features in JDK 1.4 and 1.5, including generics, annotations, autoboxing, variable arity methods, static import and asserts. In practice, I am the primary author responsible for the JLS.
        - Co-authored JLS 2nd edition. Updated the JLS to reflect all changes between Java 1.0 and Java 2. These included the addition of inner classes, significant corrections to key areas such as method lookup and binary compatibility and many others. Hardly a page went untouched.
    * Co-maintainer of the Java Virtual Machine Specification (JVMS).
        - Evolution of the JVM. This includes work to support new language features in the past and present. Latest projects included JVM support for dynamically typed programming languages, being done in the framework of JSR292 of the Java Community Process, which I led until my departure from Sun.
        - Co-author of the Java SE 7 edition of the JVMS, which covers all changes for Java SE 5, 6 and 7. In particular, the new model for byte code verification, and all changes required due to language changes and their corresponding reflective support.
        - Contributor to JVMS 2nd edition. Refined the linking and loading model, including clear notions of resolution and access control, and class loader type safety (See OOPSLA 98 paper). Also corrected method lookup semantics.
    * Senior contributor on various topics
        - Design and implementation of reflection support for generics in JDK 1.5.
        - Development of the J2ME CLDC 1.1 byte code verifier specification.
        - Designed several alternate implementation schemes for the corrected method lookup semantics (see patents).
        - Troubleshooting and consulting on many other architectural and security related issues.

- **September 1994 - February 1997.** Staff Scientist, Animorphic Systems.
    - **Responsibility:**
        * Participated in bootstrapping and various other aspects of the Animorphic Smalltalk system. The Animorphic Smalltalk system was a ultra-high performance Smalltalk system including VM, IDE and base library. Realistic benchmarks were 2.5 - 4 times the speed of any commercial Smalltalk. Animorphic was

acquired by Sun in 1997, and some of the technology was used as the basis for the Hotspot Java VM.

  - Designed and co-implemented Mixin-based extension to Smalltalk. This is the only high performance implementation of mixins to date, utilizing VM support to make overhead negligible. See unpublished manuscripts for further details.
  - Designed and co-implemented second generation Strongtalk typechecker.
  - Co-designed and co-implemented mirror based reflection in Animorphic Smalltalk. Mirrors have great significance for software distribution and deployment (See OOPSLA 2004 paper).

- **February 1992 - August 1994.** Staff Scientist, Horizon Technologies.
  - **Responsibility:** Co-designer of the Strongtalk type system of Smalltalk. Primarily responsible for the design of the type system, and for the design and implementation of the typechecker. This was the first type system for Smalltalk suited to realistic use for large scale production programming in an incremental environment (see OOPSLA 93 paper, listed under publications).

Publications

Books

- *The Java Virtual Machine Specification, Java SE 7 Edition,* Tim Lindholm, Frank Yellin, Gilad Bracha and Alex Buckley. Addison-Wesley, February 2013.
- *The Java Language Specification, Java SE 7 Edition,* James Gosling, Bill Joy, Guy Steele, Gilad Bracha and Alex Buckley. Addison-Wesley, February 2013.
- *The Java Language Specification, Third Edition,* James Gosling, Bill Joy, Guy Steele and Gilad Bracha. Addison-Wesley, June 2005.
- *The Java Language Specification, Second Edition,* James Gosling, Bill Joy, Guy Steele and Gilad Bracha. Addison-Wesley, 2000.

Papers

- *Modules as Objects in Newspeak.* Gilad Bracha, Peter von der Ahé, Vassili Bykov, Yaron Kashai, William Maddox and Eliot Miranda. Proceedings of the 24th European Conference on Object Oriented Programming (ECOOP), June 2010. Won best paper award.

- *Executable Grammars,* Gilad Bracha. Electronic Notes on Theoretical Computer Science, Volume 193C, pp. 3-18, special Festschrift issue in honor of Prof. Gary Lindstrom.

- *Mirrors: Design Principles for Meta-level Facilities of Object-Oriented Languages,* Gilad Bracha and David Ungar. Proceedings of the Nineteenth ACM Conference on Object-Oriented Programming Systems, Languages and Applications (OOPSLA) , October 2004.

- *Adding Wildcards to the Java Programming Language,* Mads Torgersen, Christian Plesner-Hansen, Erik Ernst, Peter von der Ahé, Neal Gafter and Gilad Bracha. Proceedings of the 19th ACM Symposium on Applied Computing, March 2004.

- *Making the Future Safe for the Past: Adding Genericity to the Java Programming Language,* Gilad Bracha, Martin Odersky, David Stoutamire and Philip Wadler. Proceedings of the Thirteenth ACM Conference on Object-Oriented Programming Systems, Languages and Applications (OOPSLA) , October 1998.

- *Dynamic Loading in the Java Virtual Machine,* Sheng Liang and Gilad Bracha. Proceedings of the Thirteenth ACM Conference on Object-Oriented Programming Systems, Languages and Applications (OOPSLA) , October 1998.

- *Strongtalk: Typechecking Smalltalk in a Production Environment,* Gilad Bracha and David Griswold. Proceedings of the Eighth ACM Conference on Object-Oriented Programming Systems, Languages and Applications (OOPSLA) , September 1993.

- *Modularity Meets Inheritance,* Gilad Bracha and Gary Lindstrom. Proceedings of the IEEE International Conference on Computer Languages, April 1992.

- *Mixin-based Inheritance,* Gilad Bracha and William Cook. Proceedings of the Joint OOPSLA/ECOOP Conference, October 1990.

- *GCI - A Tool for Developing Interactive CAD User Interfaces,* Ehud Gudes and Gilad Bracha. Software - Practice and Experience, Vol. 17(11) pp. 783-799 (November 1987).

Unpublished manuscripts

- *An Abstraction for Version Control Systems,* Matthias Kleine, Robert Hirschfeld and Gilad Bracha. Hasso Plattner Institute Technical Report 54, University of Potsdam, April 2012.

- *Pattern Matching for an Object-Oriented Dynamically Typed Programming Language,* Felix Geller, Robert Hirschfeld and Gilad Bracha. Hasso Plattner Institute Technical Report 36, University of Potsdam, June 2010.
- *Mixins in Strongtalk,* Lars Bak, Gilad Bracha, Steffen Grarup, Robert Griesemer, David Griswold and Urs Hoelzle. Invited paper at ECOOP 2002 workshop on inheritance. Available at my web page.

Tutorials

- *A Short Introduction to Newspeak*, Gilad Bracha. Inaugural ECOOP summer school, ECOOP 2008. Paphos, Cyprus, July 2008.

Service to the Research Community

I have served on a number of program committees, including:

- SPLASH/OOPSLA 2011: ACM Conference on Object-Oriented Programming, Systems, Languages and Applications, Portland, Oregon, October 2011.
- ECOOP 2011. 25th European Conference on Object-Oriented Programming, Lancaster, UK, July 2011.
- DLS 2009, Dynamic Language Symposium, Orlando, Florida, October 2009.
- FOOL 16: 16th Workshop on Foundations of Object-Oriented Languages, January 2009.
- EOOLT 2008: 2nd International Workshop on Equation-Based Object-Oriented Languages and Tools. Paphos, Cyprus, July 2008.
- POPL 2008. Principles of Programming Languages, San Francisco, CA, January 2008.
- ESUG 2007. European Smalltalk User Group conference, August 2007.
- DLS 2007, Dynamic Language Symposium, Montreal, Quebec, October 2007.
- ECOOP 2007. 21st European Conference on Object-Oriented Programming, Berlin, Germany, July 2007.
- DLS 2006, Dynamic Language Symposium, Portland, Oregon, October 2006.
- ESUG 2006. European Smalltalk User Group conference, September 2006.

- JMLC 2006. Joint Modular Languages Conference, Oxford, UK, September 2006.
- ECOOP 2006. 20th European Conference on Object-Oriented Programming, Nantes, France, July 2006.
- NODe 2005: Net.Object Days 2005, Erfurt, Germany, September 2005.
- ECOOP 2004: 18th European Conference on Object-Oriented Programming, Oslo, Norway, June 2004.
- OOP track at SAC 2004: Object Oriented Programming track at the 19th Annual ACM Symposium on Applied Computing, Nicosia, Cyprus, March 2004.
- FOOL 11: 11th Workshop on Foundations of Object-Oriented Languages, Venice, Italy, January 2004.
- ASIAN 2003: Eighth Asian Computing Science Conference, Mumbai, India, December 2003.
- FOOL 10: 10th Workshop on Foundations of Object-Oriented Languages, New Orleans, January 2003.
- OOPSLA 2002: ACM Conference on Object-Oriented Programming, Systems, Languages and Applications, Seattle, Washington, November 2002.
- ECOOP 2002: 16th European Conference on Object-Oriented Programming, Malaga, Spain, June 2002.
- Reflection 01: 3rd International Conference on Meta-Level Architectures and Reflection, Kyoto, Japan September 2001.
- ECOOP 2001: 15th European Conference on Object-Oriented Programming, Budapest, Hungary, June 2001.
- FOOL 7: 7th Workshop on Foundations of Object-Oriented Languages, Boston, January 2000.
- Reflection 99: 2nd International Conference on Meta-Level Architectures and Reflection, St. Malo, France July 1999.
- TOOLS Europe 99: Technology of Object-Oriented Languages and Systems, Nancy, France, June 1999.
- TOOLS USA 98: Technology of Object-Oriented Languages and Systems, Santa Barbara, California, August 1998.

Talks

Invited Talks

- Dart - A Well Structured Web Programming Language. Lang.Next 2012, Microsoft Corporation, Redmond, Washington, April 2012.
- A Quick Tour of Dart. Stanford University, November 2011.
- A Walk on the Dart Side. Dynamic Language Symposium, OOPSLA 2011, Portland, Oregon, October 2011.
- Dart: A New Programming Language for Structured Web Programmiing. With Lars Bak, keynote at GOTO conference. Aarhus, Denmark, October 2011.
- The Brave New World of Full Service Computing. Microsoft Research, Redmond, Washington, May 2010.
- Modules: Dreams and Reality. AOSD 2011, Porto de Galinhas, Brazil, March 2011.
- Java: A Post Mortem. JAX 2010. Mainz, Germany, May 2010.
- Newspeak: A Principled Dynamic Language. JAX 2010. Mainz, Germany, May 2010.
- Deconstructing Java. IBM Workshop on Programming Languages and Environments. Haifa, Israel, April 2010.
- Newspeak's Children: Avarice & Sloth. 26th IFIP WG2.8 meeting. Frauenchiemsee, Germany, June 2009.
- Hopscotch: An IDE and GUI Application Framework for Newspeak. Lang.Net 09, Microsoft Corporation, Redmond, Washington, April 2009.
- Embedding DSLs in Newspeak: NewShell, EBNF and Hopscotch. DSL Dev Con 09, Microsoft Corporation, Redmond, Washington, April 2009.
- Newspeak 101 for Java Programmers. JavaZone 2008. Oslo, Norway, September 2008.
- Newspeak: Evolving Smalltalk for the Age of the Net. Keynote at ESUG 2008, Amsterdam, Holland, August 2008.
- Tampering with Perfection: From Smalltalk to Newspeak. Smalltalk Solutions keynote, June 2008.
- Learning from Legacy: Design Lessons from Java. International Academic Computing Festival, Krakow, Poland, March 2008.

- The Newspeak Programming Language. Lang.Net 08, Microsoft Corporation, Redmond, Washington, January 2008.
- Newspeak: Not just for English Socialists Anymore. FOOL 2008. San Francisco, California, January 2008.
- Towards a Language for Network Serviced Applications. Presented at Google, January 2008.
- Executable Grammars in Newspeak. JAOO 2007: Java Technology and Object-Oriented Software Engineering, Aarhus, Denmark, September 2007.
- Reflection, Hotswapping and the Future of Software. Modelica Workshop, Linkoping, Sweden, February 2007.
- Support for Dynamically Typed Languages on the Java Platform. Lang.Net 06, Microsoft Corporation, Redmond, Washington, August 2006.
- Pluggable Types: Mandatory Typing Considered Harmful?. FOOL 2006, Charleston, South Carolina, January 2006.
- Objects as Software Services. Dynamic Language Symposium, OOPSLA 2005, San Diego, California, October 2005. Repeated at the New England Programming Language Symposium. February 2006, and Google, March 2007. The latter version is available on Google video.
- Dynamically Typed Languages on the Java Platform. JAOO 2005: Java Technology and Object-Oriented Software Engineering, Aarhus, Denmark, September 2005.
- Lessons from the OO Language Wars. Banquet speech at the 19th European Conference on Object-Oriented Programming, Glasgow, Scotland, July 2005.
- Towards Secure System Programming Languages. Plenary keynote at SAC 2004, the 19th Annual ACM Symposium on Applied Computing, Nicosia, Cyprus, March 2004.
- Generics in the Java programming Language: Overview and Rationale. JAOO 2003: Java Technology and Object-Oriented Software Engineering, Aarhus, Denmark, September 2003.
- A High Performance Mixin Implementation. ECOOP 2002 Inheritance Workshop, Malaga, Spain, June 2002.
- The Future of Java. Research Center for Integrational Software Engineering (RISE) workshop, Linkoping, Sweden, January 2002.
- Adding Genericity to the Java programming Language. JAOO 2001: Java Technology and Object-Oriented Software Engineering, Aarhus, Denmark, September 2001.

- Adventures in Computational Theology. FTfJP 2001: Formal Techniques for Java-like Programs workshop at ECOOP 2001, Budapest, Hungary, June 2001.
- Class Loading Issues in Java. RAPL 2000: Recent Advances in Programming Languages, New Delhi, India, December 2000.
- Genericity in the Java Programming Language. Workshop on Effective Implementation of Object-Oriented Programming Languages, Schloss Dagstuhl, Germany, November 2000.
- Making Java Easier to Type and Easier to Type. ETAPS 99: European Joint Conference on Theory and Practice of Software, Amsterdam, March 1999.
- Formal Methods for Java: A Perspective from Sun. FUJ 98: Formal Underpinnings of Java workshop at OOPSLA 98, Vancouver, Canada, October 1998.

Colloquia

Over the years, I have given colloquia at numerous institutions in Europe, Asia and the United States.

Patents

I hold twenty US patents: 6,766,521; 6,763,397; 6,725,280; 6,687,760; 6,687,759; 6,643,711; 6,618,769; 6,618,855, 6,601,114; 6,430,569; 6,393,491; 7,051,343; 7,197,511; 7,444,648; 7,458,061; 7,574,700; 7,669,184; 7.735,070; 7,810,077, 7,895,156.