

# Pascal Costanza

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## Educational Background

**University of Bonn** 1998 - 2004 PhD in Computer Science

**University of Bonn** 1990 - 1998 Master's degree in Computer Science

## Past Experience

### Academic Experience

1/1998 - 9/1998 University of Bonn, Germany: teaching and project acquisition

9/1998 - 12/1998 University of Bonn, Germany: POLITeam Project

2/1999 - 7/1999 University of Bonn, Germany: teaching and preparation of TAILOR Project

8/1999 - 3/2004 University of Bonn, Germany: TAILOR Project (DFG)

4/2004 - 12/2004 University of Bonn, Germany: teaching and project acquisition

1/2005 - 9/2005 Vrije Universiteit Brussel, Belgium: AspectLab Project

10/2005 - 3/2008 Vrije Universiteit Brussel, Belgium: Project "Context-oriented Programming" (IWT)

4/2008 - now Vrije Universiteit Brussel, Belgium: AspectLab bis Project & ALEAR Project

### Industrial Experience

1989 - 1992 infill Computer GmbH, Troisdorf, Germany: programming / teaching and presentation systems

1992 - 1993 Heynmöller Informatik GmbH, Bonn, Germany: programming / information systems

7/1993 - 3/1995 comet GbR, Troisdorf, Germany: founder and co-owner

4/1995 - 12/1997 comet GbR / M & T Online Service GbR, Troisdorf, Germany: project lead / web presentations for several Nestlé brands and Hagemann Verlag, among others

4/1998 - 7/1998 GiKOM Pro, Bonn, Germany: programming / hospital information systems

2/1999 - 4/1999 DLR, German Aerospace Center, Cologne, Germany: Project "Medizin Telematik Zentrale" (Medicine Telematics Center), programming

## Research Interests

**Programming languages:** design, implementation, multi-paradigm programming languages, reflectively extensible programming languages, independent extensibility

**Software development:** context-oriented programming, domain-oriented programming, design patterns / pattern languages, dynamic software evolution, aspect-oriented programming, metaprogramming

**Social issues:** psychology of programming, extreme programming, agile software methodologies, post-modern programming, deconstruction

**Long-term goals:** participatory ("open-source") programming language design, social issues of programming languages, empirical methods for programming language evaluation

## Major Accomplishments

Co-designed and implemented the first compiler for Lava, an integration of delegation into a strongly-typed class-based programming language. Contrary to object-oriented programming languages that base inheritance mechanism on a class hierarchy, there are so-called prototype-based languages that implement inheritance exclusively on objects, via delegation. Such languages do not only allow sound overriding of methods of a “parent” object in a “child” object, but parent objects can also be dynamically replaced resulting in a dynamic change of an inheritance hierarchy. This enables important kinds of dynamic software evolution. The design and implementation of the Lava compiler was a major part of Pascal Costanza’s master thesis that was supervised by, and based on an original model by Günter Kniesel. Pascal Costanza’s major results were a seamless integration into the Java programming language, and the detection and fix of a hole in the static type system of the original design. Subsequently, Lava has been reimplemented several times using different implementation strategies, but the original design has largely remained the same which is the first working integration of class-based and prototype-based features into a strongly-typed language. Lava is mainly used in academia.

Originated the ClassFilters package, a framework for load-time transformation of Java classes. This has been rewritten as JMangler under his supervision (joint work with Günter Kniesel) which is now a widely used framework, both in academia and industry. The major results of that work are two-fold. On the technical level, JMangler is the first load-time transformation framework that is neither implemented as a custom Java Virtual Machine implementation nor as a custom Java class loader. This ensures applicability in a much wider range of scenarios than other approaches. On the conceptual level, JMangler is the first and currently only framework that allows transformations of class files to be expressed as independently extensible transformer components. This means that the developer of a transformer component does not need to be aware of the complete transformation process and/or other transformer components in order to express desired features to be added to a set of Java classes. As a consequence, JMangler is a powerful and convenient platform-independent framework for the introduction of systematic properties into a Java program. This has been effectively taken advantage of in several scenarios, for example as a basis for an alternative implementation of Lava that enables delegation to pure Java classes, or as a basis for an efficient customized code-coverage tool that has been used in large industrial projects.

Conceived the Gilgul model, an alternative conceptualization of object identity, and implemented the first compiler for a language based on that model. The major results of that work reside on two different levels. On the conceptual level, Gilgul strictly separates the notions of reference and comparison that are usually subsumed in the concept of object identity. Although it has been acknowledged in previous related work that object identity can be used for these two purposes, Gilgul is the first model to separate these two concerns and introduce means to manipulate them independently. On the pragmatic level, Gilgul allows for dynamic object replacement without the need to know all the references to an object and without consistency problems. The language extension based on that model considers a variety of important engineering issues: It defines control facilities to express restrictions on replaceability of objects; it introduces a static type system that balances the needs of checkability and flexibility; and it allows for proper replacement of active objects, including objects that execute non-terminating loops (for example objects that implement web services). Gilgul has been well-received, mainly by implementors of virtual machines and supporting technology, as a clean model for dynamic software evolution and an enabling technology for sophisticated debuggers.

Developed the notion of Context-oriented Programming as joint work with Robert Hirschfeld. Context-dependent behavior is becoming increasingly important for a wide range of application domains, from pervasive computing to common business applications. Unfortunately, mainstream programming languages do not provide mechanisms that enable software entities to adapt their behavior dynamically to the current execution context. This leads developers to adopt convoluted designs to achieve the necessary runtime flexibility. Context-oriented Programming (COP) is a new programming technique that addresses this problem. COP treats context explicitly, and provides mechanisms to dynamically adapt behavior in reaction to changes in context, even after system deployment at runtime. Essential concepts are: layers that group behavioral variations, scoped activation and deactivation of layers at runtime, and context which is any information that is computationally accessible. Pascal Costanza implemented ContextL, the first and currently most mature implementation of these concepts as an extension to Common Lisp. Distinguishing characteristics are: an efficient implementation of layer activation and deactivation, a reflective architecture for controlling layer activation and deactivation without compromising efficiency, and a comprehensive set of features to make ContextL convenient to use. ContextL is used in various industrial projects, typically for web applications, including in large-scale scenarios.

## Other Noteworthy Accomplishments

Introduced Internet technologies (WWW, http, HTML) to his company in 1994, making it one of the first companies in Germany to develop commercial websites.

Introduced the Java programming language to his company in 1996, making it one of the first German companies to develop software in Java.

Was accepted for the OOPSLA Doctoral Symposium in 2001.

Helped forming the German AOSD community by co-organizing workshops. Adapted and introduced the Writers' Workshop format to that community. German and subsequently European AOSD workshops have stuck to that format since then.

Established the notion of Unanticipated Software Evolution (jointly with Günter Kniesel) by organizing workshops and a special issue of the Journal of Software Maintenance and Evolution, published by John Wiley & Sons. Other researchers have started to adopt this term.

Has written a guide to the Common Lisp programming language and published it at his website. This has been widely received as excellent introductory material and is linked prominently from many sites, including as recommended links by both commercial and open-source vendors of Common Lisp implementations. As of February 2004, a Korean translation, and as of August 2005 a Turkish translation of this guide have been published on the web.

Was the main organizer of the 1st European Lisp and Scheme Workshop that took place in conjunction with ECOOP 2004 in Oslo, Norway on June 13, 2004. With 40 participants, this was the most successful workshop at ECOOP 2004, although the workshop was originally rejected by the ECOOP organizers and the workshop was organized completely independently from ECOOP. (The second most successful workshop at ECOOP 2004 was the 2nd Workshop on Object-Oriented Programming Language Engineering for the Post-Java Era with 24 participants, also co-organized by Pascal Costanza.) Since then, the European Lisp Workshop has been established as an official annual workshop at ECOOP. Is the main organizer of the 1st European Lisp Symposium, organized independently in Bordeaux, France in 2008.

Currently contributes to the "dynamic languages" community by organizing events and presentations.

Released a first version of AspectL in 2004, an aspect-oriented extension of Common Lisp which also incorporates some first abstractions for context-oriented programming. Released a first version of ContextL in 2005, the first publicly available language extension specifically designed for context-oriented programming.

## Projects

### TAILOR Project

**Funding Organization:** Deutsche Forschungsgemeinschaft (DFG), CR 65/13

**Contractor:** University of Bonn, Institute of Computer Science III (Prof. Dr. A. B. Cremers).

**Duration:** August 1999 - March 2004.

**Volume:** Three years for one research assistant and two student assistants.

**Position:** Project acquisition and management.

**Abstract:** The TAILOR Project has dealt with enhancements of programming languages and runtime systems that allow for unanticipated adaptability of software on the stringent condition that software components are to be included whose source code is not available, and that modifications can still be made on already active programs. The major results are improvements of the Lava programming language, the JMangler framework for load-time transformation of Java class files and the Gilgul programming language (see above). This project has been very successful and has given rise to two journal special issues, four journal publications, three PhD theses, ten diploma theses, six conference papers, twelve workshop papers, four workshop reports, three posters at conferences, and one book chapter.

### Context Sensitive Intelligence

**Funding Organization:** Deutsche Telekom Laboratories, Berlin, Germany

**Contractor:** University of Bonn, Institute of Computer Science III (Prof. Dr. A. B. Cremers).

**Duration:** Autumn 2004 - Autumn 2007.

**Volume:** ca. 800.000 Euro (ca. three research assistants and six student assistants).

**Position:** Contributor to project acquisition.

**Abstract:** Even modern component architectures do not provide for easily manageable context-sensitive adaptability, a key requirement for ambient intelligence. The reason is that components are too large – providing black boxes with adaptation points only at their boundaries – and too small – lacking good means for expressing concerns beyond the scope of single components – at the same time. The goal of this project is to develop a framework that makes components more fine-grained so that adaptation points inside of them become accessible, and more coarse-grained so that changes of single components result in the necessary update of structurally constrained dependants. This will lead to higher quality applications that fit better into personalized and context-aware usage scenarios.

## AspectLab I

**Funding Organization:** Instituut voor de Aanmoediging van Innovatie door Wetenschap en Technologie in Vlaanderen (IWT).

**Main Contractor:** Vrije Universiteit Brussel.

**Other Contractors:** Katholieke Universiteit Leuven, Universiteit Gent.

**Duration:** Autumn 2004 - Autumn 2006.

**Volume:** ca. 1.400.000 Euro.

**Position:** Project execution.

**Abstract:** The strategic basic research project AspectLab addresses the development of complex, distributed software systems using Aspect-Oriented Software Development methods, languages and techniques. It proposes a collaboration between the current AOSD actors in Flanders so as to strengthen generic research in this field and demonstrate the power and advantages of AOSD to Flemish software industry for a range of non-trivial and representative applications.

## Context-oriented Programming

**Funding Organization:** Instituut voor de Aanmoediging van Innovatie door Wetenschap en Technologie in Vlaanderen (IWT).

**Contractor:** Dr. Pascal Costanza.

**Academic Promoter:** Vrije Universiteit Brussel, Programming Technology Lab (Prof. Dr. Theo D'Hondt).

**Industrial Promoter:** Unisys Belgium, Planning and Simulation practice (Dr. Kris van Marcke).

**Duration:** October 2005 - September 2007.

**Volume:** One post-doc grant (full-time).

**Abstract:** The goal of this project is to develop and establish a notion of Context-oriented Programming that goes beyond traditional programming paradigms to provide a high degree of adaptivity and/or adaptability. There is already a tradition of research in several fields of computer science that partially cover these notions. However, this proposal does not focus on domain-specific solutions, but rather on the development of a programming paradigm and supporting general-purpose programming language constructs and techniques that improve the maintainability, robustness and reusability of software that must fit in highly dynamic environments.

## AspectLab II

**Funding Organization:** Instituut voor de Aanmoediging van Innovatie door Wetenschap en Technologie in Vlaanderen (IWT).

**Main Contractor:** Vrije Universiteit Brussel.

**Other Contractors:** Katholieke Universiteit Leuven, Universiteit Gent.

**Duration:** Spring 2007 - Spring 2009.

**Volume:** ca. 1.400.000 Euro.

**Position:** Contribution to project acquisition.

**Abstract:** See AspectLab I.

## **Fundamental Issues in Software Engineering: Modelling, Verification and Evolution of Software (MoVES)**

**Funding Organization:** Belgian Federal Science Policy (BelSPo).

**Main Contractor:** Vrije Universiteit Brussel.

**Other Contractors:** Universiteit Antwerpen, Université Catholique de Louvain-la-Neuve, Université Libre de Bruxelles, Facultés Universitaires Notre-Dame de la Paix Namur, Université de Liège, Laboratoire d'Informatique Fondamentale de Lille – INRIA, Imperial College London, Delft University of Technology.

**Duration:** January 2007 - December 2011.

**Volume:** ca. 3.100.000 Euro.

**Position:** Project acquisition, delegate for Programming Technology Lab, Vrije Universiteit Brussel.

**Abstract:** Software-intensive systems are among the most complex artefacts ever built. In the development of such systems, the use of rigorous models and analysis methods is essential to make sure that the software satisfies its requirements and exhibits the desired properties (e.g., safety, security, reliability, consistency). At the same time, in order to adapt to the constantly changing requirements and technology, these systems must be able to evolve over time, without breaking their essential properties.

This project combines the leading Belgian research teams in software engineering, with recognised scientific excellence in model-driven engineering (MDE), software evolution, formal modelling and verification (FMV) and aspect-oriented software development (AOSD). The project aims to advance the state of the art in each of these domains. The long term objective of this network is to strengthen existing collaborations and forge new links between those teams, and to leverage and disseminate their research expertise in this domain at a European level.

## **Variability in Software-Intensive Product Development (VariBru)**

**Funding Organization:** Institut for the encouragement of Scientific Research and Innovation of Brussels (IRSIB).

**Main Contractor:** Sirris, Brussels.

**Other Contractors:** Vrije Universiteit Brussel, Université Libre de Bruxelles, Université Catholique de Louvain-la-Neuve.

**Duration:** October 2007 - September 2010.

**Volume:** ca. 550.000 Euro.

**Position:** Project acquisition, delegate for Programming Technology Lab, Vrije Universiteit Brussel.

**Abstract:** Over the last decade, the management of variability has become a major bottle neck in the development, maintenance and evolution of software-intensive products. The VariBru project addresses this strategic problem of builders of software intensive products. To support variability management, numerous variability modeling techniques have been proposed both by academia and industry. Given this large state of the art in variability management techniques, it is remarkable that implementing an efficient variability strategy still poses so many challenges to software intensive product builders.

Most of them however address variability only from one perspective. The research performed in this project starts from the hypothesis that an integrated approach across all perspectives is a necessary prerequisite for a successful introduction of variability. The result will be an integrated approach in which the decision knowledge can be used to guide product builders through an innovative process of selecting appropriate variability approaches and where the integrated realization knowledge assembles the relevant knowledge from all the three perspectives to realize selected variability approaches.

## **Software Technology for Adaptable Distributed Middleware (STADiUM)**

**Funding Organization:** Instituut voor de Aanmoediging van Innovatie door Wetenschap en Technologie in Vlaanderen (IWT).

**Main Contractor:** Katholieke Universiteit Leuven.

**Other Contractors:** Vrije Universiteit Brussel, IMEC vzw Leuven.

**Duration:** January 2009 - December 2012.

**Volume:** ca. 2.500.000 Euro.

**Position:** Project acquisition, delegate for Programming Technology Lab, Vrije Universiteit Brussel.

**Abstract:** Contemporary distributed software systems have become extremely heterogeneous, dynamic and large-scale including backend servers, regular PCs and various mobile and ubiquitous devices, as well as diverse network infrastructures, such as mobile ad-hoc networks and wireless sensor networks.

The STADiUM project focuses on this complex context which requires applications and middleware to be configured, optimized and adapted to the very different devices, the dynamic character of the network, and its scale.

A profound solution to handle this heterogeneity requires next-generation middleware that enables explicit but controlled use of (monitored) information from all levels to guide the configuration, optimization and adaptation.

## **Reflective Reconfiguration Support for Context-dependent Software Updates (RECOCO)**

**Funding Organization:** Fonds Wetenschappelijk Onderzoek (FWO).

**Main Contractor:** Vrije Universiteit Brussel, Programming Technology Lab.

**Other Contractor:** Katholieke Universiteit Leuven, DISTRINET.

**Duration:** January 2009 - December 2012.

**Volume:** ca. 480.000 Euro.

**Position:** Project acquisition, delegate for Programming Technology Lab, Vrije Universiteit Brussel.

**Abstract:** Ensuring that software can display different behavior in different use contexts requires adapting software at runtime in dynamically created scopes (e.g. in a thread, in a client session, in a collaboration). Context-Oriented Programming (COP) offers dedicated language constructs for performing such dynamically scoped adaptations. However, like any dynamic software adaptation technique, COP hits a conceptual barrier when new variations of existing program entities are integrated into a running system: Although dynamically scoped adaptations inherently preserve some structural integrity requirements, global state consistency requirements cannot be automatically ensured. Managing dynamically scoped adaptations therefore requires additional application-specific logic from within the system itself. Currently this application-specific logic must be added by the programmer in an ad-hoc way, which pollutes the systems design. The aim of this project is two-fold: (i) the description of the foundations of context-oriented programming that allows systematic reasoning about system-wide consistency in the presence of dynamically scoped adaptations, and (ii) based on this foundation, the creation of a reflective architecture for context-oriented programming languages that accommodates implementing application-specific policies for dealing with consistency conflicts.

## Teaching

### University of Bonn

- Softwaretechnologie (lecture), Prof. Dr. A. B. Cremers, G. Kniesel, P. Costanza, SS 2000.
- Informatik I (lecture), Prof. Dr. J. K. Anlauf, WS 2000/2001 (practical sessions).
- Softwaretechnologie (lecture), Prof. Dr. A. B. Cremers, Dr. G. Kniesel, P. Costanza, WS 2001/2002.
- Softwaretechnologie (lecture), Prof. Dr. A. B. Cremers, P. Costanza, H. Mügge, SS 2003.
- Extreme Programming (practical training), Prof. Dr. A. B. Cremers, P. Costanza, H. Mügge, WS 2003/2004.
- Object-Oriented Programming (study group), Prof. Dr. A. B. Cremers, P. Costanza, WS 2003/2004.
- Object-Oriented Programming (study group), Prof. Dr. A. B. Cremers, Dr. G. Kniesel, P. Costanza, SS 2004.
- Object-Oriented Software Construction (lecture), Prof. Dr. A. B. Cremers, Dr. M. Won, P. Costanza, SS 2004.

### Vrije Universiteit Brussel

- Technieken van de Artificiële Intelligentie I / Symbolic Programming in Common Lisp (lecture), Dr. P. Costanza, WS 2005/2006.
- Technieken van de Artificiële Intelligentie I / Symbolic Programming in Common Lisp (lecture), Dr. P. Costanza, WS 2006/2007.
- Actual Trends in Artificial Intelligence (lecture), WS & SS 2008/2009.

## Publications

### Journal Papers

- Robert Hirschfeld, Pascal Costanza, Oscar Nierstrasz, Context-Oriented Programming, in *Journal of Object Technology*, Vol. 7, No. 3, March-April 2008, pp. 125-151.
- Charlotte Herzeel, Kris Gybels, Pascal Costanza, Coen De Roover, Theo D'Hondt, Forward Chaining in HALO: An Implementation Strategy for History-based Logic Pointcuts, in *Computer Languages, Systems & Structures*, Elsevier, 2008 (in press).

### Conference Papers

- Pascal Costanza, Günter Kriesel, Armin B. Cremers, Lava - Spracherweiterungen für Delegation in Java (in German), in: Clemens H. Cap (ed.), *Java-Informationen-Tage 1999 (JIT '99)*, Springer (Informatik Aktuell), 1999 (acceptance rate 38%).
- Pascal Costanza, Oliver Stiemerling, Armin B. Cremers, Object Identity and Dynamic Recomposition of Components, in: Wolfgang Pree (ed.): *Technology of Object-Oriented Languages and Systems - TOOLS 38*, Proceedings, 12-14 März 2001, Zürich, Switzerland, IEEE Computer Society Press, 2001 (acceptance rate 40-50%).
- Pascal Costanza and Arno Haase, The Comparand Pattern, *Sixth European Conference on Pattern Languages of Programs (EuroPLoP 2001)*, Kloster Irsee, Germany, July 2001.
- Pascal Costanza, Dynamic Replacement of Active Objects in the Gilgul Programming Language, *First International IFIP / ACM Working Conference on Component Deployment*, Berlin, Germany, June 20-21, 2002, Springer LNCS (acceptance rate 30%).
- Pascal Costanza, How to Make Lisp More Special, *International Lisp Conference 2005*, Stanford, California, USA, June 19-22, 2005, proceedings (acceptance rate 90%).
- Pascal Costanza and Robert Hirschfeld, Language Constructs for Context-oriented Programming – An Overview of ContextL, *Dynamic Languages Symposium 2005 (DLS05)*, co-located with OOPSLA'05, October 18, 2005, San Diego, California, USA. Proceedings, ACM Digital Library (acceptance rate 36%).
- Alexandre Bergel, Robert Hirschfeld, Siobhan Clárke, Pascal Costanza, AspectBoxes – Controlling the Visibility of Aspects, *International Conference on Software and Data Technologies (ICSOFT 2006)*, Setúbal, Portugal, September 11-14, 2006, INSTICC Press, ISBN 972-8865-69-4, & Springer LNCS, 2008 (acceptance rate 13%).
- Pascal Costanza, Robert Hirschfeld, Wolfgang De Meuter, Efficient Layer Activation for Switching Context-dependent Behavior, *Joint Modular Languages Conference 2006 (JMLC2006)*, Oxford, England, September 13-15, 2006, Springer LNCS (acceptance rate 64%).
- Pascal Costanza and Robert Hirschfeld, Reflective Layer Activation in ContextL, *ACM Symposium on Applied Computing 2007 (SAC 2007)*, Technical Track on Programming for Separation of Concerns (PSC 2007), Proceedings, Seoul, Korea, March 11-15, 2007, ACM Press (acceptance rate 33%).
- Charlotte Herzeel, Kris Gybels, Pascal Costanza, Theo D'Hondt, Modularizing Crosscuts in an E-commerce Application in Lisp using HALO, *International Lisp Conference 2007 (ILC 2007)*, Cambridge, UK, April 1-4, 2007, ACM Digital Library (to appear, acceptance rate 32%).
- Jorge Vallejos, Peter Ebraert, Brecht Desmet, Tom van Cutsem, Stijn Mostinckx, Pascal Costanza, The Context-Dependent Role Model, *Proceedings of the 7th IFIP International Conference on Distributed Applications and Interoperable Systems (DAIS 2007)*, Paphos, Cyprus, June 5-8, 2007. Springer LNCS, 2007 (acceptance rate 25%).
- Robert Hirschfeld, Pascal Costanza, Michael Haupt, An Introduction to Context-oriented Programming with ContextS, *Generative and Transformational Techniques in Software Engineering*, International Summer School, GTTSE 2007, Braga, Portugal, July 2-7, 2007. Springer LNCS, 2008.

- Brecht Desmet, Jorge Vallejos, Pascal Costanza, Wolfgang De Meuter, Theo D'Hondt, Context-Oriented Domain Analysis, *Modeling and Using Context*, Sixth International and Interdisciplinary Conference on Modeling and Using Context, Roskilde University, Denmark, August 20-24, 2007. Proceedings. Springer LNCS, 2007 (acceptance rate 35%).
- Charlotte Herzeel, Kris Gybels, Pascal Costanza, Coen De Roover, Theo D'Hondt, Forward Chaining in HALO: An Implementation Strategy for History-based Logic Pointcuts, *International Conference on Dynamic Languages (ICDL 2007)*, Lugano, Switzerland, August 25-31, 2007. Proceedings. ACM Digital Library, 2008 (acceptance rate 69%).
- Peter Ebraert, Jorge Vallejos, Pascal Costanza, Ellen Van Paesschen, Theo D'Hondt. Change-Oriented Software Engineering, *International Conference on Dynamic Languages (ICDL 2007)*, Lugano, Switzerland, August 25-31, 2007. Proceedings. ACM Digital Library, 2008 (acceptance rate 69%).
- Brecht Desmet, Kristof Vanhaesebrouck, Jorge Vallejos, Pascal Costanza, Wolfgang De Meuter. The Puzzle Approach for Designing Context-Enabled Applications, *XXVI International Conference of the Chilean Computer Science Society (SCCC 2007)*, Iquique, Chile, November 8-9, 2007. Proceedings. IEEE Computer Science Press, 2007 (acceptance rate 36%).
- Pascal Costanza, Charlotte Herzeel, Jorge Vallejos, Theo D'Hondt. Filtered Dispatch, *Dynamic Languages Symposium 2008 (DLS08)*, co-located with ECOOP 2008, Paphos, Cyprus, July 8, 2008. Proceedings, ACM Digital Library (acceptance rate 40%).

#### PhD Thesis

- Pascal Costanza, *Transmigration of Object Identity*, Dissertation, Mathematisch-Naturwissenschaftliche Fakultät, Rheinische Friedrich-Wilhelms-Universität Bonn, 2004.

#### Proceedings

- Pascal Costanza and Robert Hirschfeld (eds.), *Proceedings of the 2007 Symposium on Dynamic Languages*, Montréal, Quebec, Canada, October 22, 2007. ACM Digital Library, 2007.

#### Articles in Books

- Günter Kniesel, Pascal Costanza, Michael Austermann, JMangler - Load-time Transformation of Byte Code for Aspect-Oriented Programming, in: Robert E. Filman, Tzilla Elrad, Siobhán Clark and Mehmet Aksit, (Eds.). *Aspect-Oriented Software Development*, Addison-Wesley, 2004.
- Pascal Costanza and Arno Haase, The Comparand Pattern: Cheap Identity Testing Using Dedicated Values, in: Dragos Manolescu, James Noble and Markus Völter, (Eds.). *Pattern Languages of Program Design 5*, Addison-Wesley, 2006.

#### Workshop Papers

- Pascal Costanza, Separation of Object Identity Concerns, Workshop on Aspects and Dimensions of Concerns at ECOOP 2000, Cannes, France, June 2000.
- Oliver Stiemerling, Pascal Costanza, Armin B. Cremers, Object Identity and Dynamic Recomposition of Components, in: Jan Bosch, Clemens Szyperski, Wolfgang Weck (eds): *Proceedings of the 5th International Workshop on Component-Oriented Programming (WCOP 2000)*, Research Report No 15/00, Blekinge Institute of Technology, Department of Software Engineering and Computer Science, Karlskrona, Sweden, 2000.
- Pascal Costanza, Vanishing Aspects, Workshop on Advanced Separation of Concerns at OOPSLA 2000.
- Michael Austermann, Pascal Costanza, Günter Kniesel, Unabhängige Erweiterbarkeit für Aspekt-Orientierte Systeme (in German), in: K. Mehner, M. Mezini, E. Pulvermüller, A. Speck (eds.), *Aspektorientierung - Workshop der GI-Fachgruppe 2.1.9 Objektorientierte Software-Entwicklung*, 3./4. Mai 2001, Paderborn, Bericht tr-ri-01-233 der Universität-Gesamthochschule Paderborn, Fachbereich Mathematik/Informatik.

- Pascal Costanza, Dynamic Object Replacement and Implementation-Only Classes, 6th International Workshop on Component-Oriented Programming (WCOP 2001) at ECOOP 2001, Budapest, Hungary, June 2001.
- Pascal Costanza, Günter Kniesel, Michael Austerlmann, Independent Extensibility for Aspect-Oriented Systems, Workshop on Advanced Separation of Concerns at ECOOP 2001, Budapest, Hungary, June 2001.
- Pascal Costanza, The Programming Language Gilgul, in: *Net.ObjectDays Tagungsband*, Erfurt, 10.-13. September 2001 (Young Researchers Workshop on Generative and Component-Based Software Engineering).
- Pascal Costanza, The Programming Language Gilgul, Workshop on Engineering Complex Object-Oriented Systems for Evolution (ECOOSE) at OOPSLA 2001, Tampa, Florida, USA, October 2001.
- Günter Kniesel, Pascal Costanza, Michael Austerlmann, JMangler - A Framework for Load-Time Transformation of Java Class Files, *First IEEE International Workshop on Source Code Analysis and Manipulation (SCAM 2001)*, Proceedings, Florence, Italy, November 2001 (*acceptance rate 70%*).
- Stefan Hanenberg and Pascal Costanza, Connecting Aspects in AspectJ - Strategies vs. Patterns, First AOSD Workshop on Aspects, Components, and Patterns for Infrastructure Software at AOSD 2002, Enschede, The Netherlands, April 23, 2002.
- Pascal Costanza, Dynamically Scoped Functions as the Essence of AOP, ECOOP 2003 Workshop on Object-Oriented Language Engineering for the Post-Java Era, Darmstadt, Germany, July 22, 2003; published in *ACM SIGPLAN Notices* Volume 38, Issue 8 (August 2003), ACM Press.
- Pascal Costanza, Dynamic vs Static Typing – A Pattern-Based Analysis, 2nd Workshop on Object-Oriented Language Engineering for the Post-Java Era, ECOOP 2004, Oslo, Norway, June 14, 2004.
- Pascal Costanza, A Short Overview of AspectL, European Interactive Workshop on Aspects in Software (EIWAS'04), Berlin, Germany, September 23-24, 2004.
- Holger Mügge, Tobias Rho, Marcel Winandy, Markus Won, Armin B. Cremers, Pascal Costanza, Roman Englert, Towards Context-Sensitive Intelligence, *Software Architecture: 2nd European Workshop, EWSA 2005*, Pisa, Italy, June 13-14, 2005, Springer LNCS (*acceptance rate 41%*).
- Robert Hirschfeld and Pascal Costanza, Extending Advice Activation in AspectS, European Interactive Workshop on Aspects in Software (EIWAS), Brussels, Belgium, 2005. Updated for Open and Dynamic Aspect Languages Workshop (ODAL), co-located with AOSD 2006, Bonn, Germany, March 20, 2006.
- Brecht Desmet, Ellie D'Hondt, Pascal Costanza and Theo D'Hondt, Simulation of Quantum Computations in Lisp, 3rd European Lisp Workshop, co-located with ECOOP 2006, Nantes, France, July 3, 2006.
- Charlotte Herzeel, Kris Gybels and Pascal Costanza, A Temporal Logic Language for Context Awareness in Pointcuts, ECOOP 2006 Workshop on Revival of Dynamic Languages (RDL), Nantes, France, July 3, 2006.
- Brecht Desmet, Jorge Vallejos Vargas, Stijn Mostinckx and Pascal Costanza, Using Mixin Layers for Context-Aware and Self-Adaptable Systems, ECOOP 2006 Workshop on Object Technology for Ambient Intelligence and Pervasive Computing (OT4Aml), Nantes, France, July 4, 2006.
- Brecht Desmet, Jorge Vallejos, and Pascal Costanza, Introducing Mixin Layers to Support the Development of Context-Aware Systems, 3rd European Workshop on Aspects in Software (EWAS 2006), University of Twente, Enschede, The Netherlands, August 31, 2006.
- Brecht Desmet, Jorge Vallejos, Pascal Costanza, and Robert Hirschfeld, Layered Design Approach for context-aware systems, *First International Workshop on Variability Modelling of Software-Intensive Systems (VaMoS 2007)*, Limerick, Ireland, January 16-18, 2007, Lero Technical Report 2007-01 (*acceptance rate 53%*).
- Charlotte Herzeel, Kris Gybels, Pascal Costanza, Escaping with future variables in HALO, Seventh Workshop on Runtime Verification (RV'07), Satellite workshop of AOSD'07, Vancouver, British Columbia, Canada, March 13, 2007, Springer LNCS (*acceptance rate 55%*).

- Jorge Vallejos, Brecht Desmet, Pascal Costanza, Wolfgang De Meuter, Pervasive Communication: The Need for Distributed Context Adaptations, ECOOP 2007 Workshop on Object Technology for Ambient Intelligence and Pervasive Systems (OT4Aml), Berlin, Germany, July 30, 2007.
- Charlotte Herzeel, Pascal Costanza, Theo D'Hondt, Reflection for the Masses, Workshop on Self-Sustaining Systems (S3) 2008, Potsdam, Germany, May 15-16, 2008, Springer LNCS.
- Jorge Vallejos, Elisa Gonzalez Boix, Engineer Bainomugisha, Pascal Costanza, Wolfgang De Meuter, Éric Tanter, Towards Resilient Partitioning of Pervasive Computing Services, Proceedings of the 3rd ACM Workshop on Software Engineering for Pervasive Services 2008, Sorrento, Italy, July 6, 2008, ACM Digital Library.
- Pascal Costanza, Charlotte Herzeel, make-method-lambda considered harmful, 5th European Lisp Workshop co-located with ECOOP 2008, Paphos, Cyprus, July 7, 2008.
- Leonardo Uribe, Pascal Costanza, Charlotte Herzeel, Theo D'Hondt, Using Data Parallelism for Implementing a Quantum Simulator, 5th European Lisp Workshop, co-located with ECOOP 2008, Paphos, Cyprus, July 7, 2008.
- Charlotte Herzeel, Pascal Costanza, Theo D'Hondt, Controlling Dynamic Parallelization Through Layered Reflection, 7th Workshop on Parallel/High-Performance Object-Oriented Scientific Computing (POOSC'08), co-located with ECOOP 2008, Paphos, Cyprus, July 8, 2008.
- Pascal Costanza and Theo D'Hondt, Feature Descriptions for Context-oriented Programming, 2nd International Workshop on Dynamic Software Product Lines (DSPL'08), co-located with Software Product Line Conference 2008 (SPLC2008), Limerick, Ireland, September 8, 2008. Proceedings.

#### Tutorials / Presentations

- Pascal Costanza, Generic Functions and the CLOS Metaobject Protocol, OOPSLA'05, San Diego, California, USA, October 16, 2005.
- Pascal Costanza, Language Constructs for Context-Oriented Programming (presentation), Fourth Edition of the Belgian-Netherlands Software Evolution Workshop (BeNeVol 4), Université Libre de Bruxelles, Belgium, December 13-14, 2005.
- Pascal Costanza, Generic Functions and the CLOS Metaobject Protocol, Dynamic Languages Day, Brussels, Belgium, February 13, 2006.
- Pascal Costanza, Martin Gasbichler, Gilad Bracha, Metaprogramming & Reflection, *Latently-Typed Languages*, Dagstuhl Seminar 06181, Schloss Dagstuhl, Germany, May 1-6, 2006.
- Pascal Costanza, Robert Hirschfeld, Language Constructs for Context-oriented Programming – A Demonstration of ContextL, ECOOP 2006, Nantes, France, July 5, 2006.
- Pascal Costanza, Generic Functions and the CLOS Metaobject Protocol, Hasso-Plattner-Institut, University of Potsdam, Germany, November 17, 2006.
- Pascal Costanza, Robert Hirschfeld, Context-oriented Programming in Common Lisp: A tutorial about ContextL, International Lisp Conference 2007, Cambridge, UK, April 1, 2007.
- Pascal Costanza, Metaprogramming & Reflection, invited talk, *BeNeLux Lisp Meeting*, Streamtech b.v., The Hague, The Netherlands, July 1, 2007.
- Robert Hirschfeld, Pascal Costanza, Michael Haupt, An Introduction to Context-Oriented Programming with ContextS, 2nd Summer School on Generative and Transformational Techniques in Software Engineering, Braga, Portugal, July 2-7, 2008. Springer LNCS, 2008 (to appear).
- Pascal Costanza and Robert Hirschfeld, Recent Developments in Context-oriented Programming, ECOOP 2007, Berlin, Germany, August 2, 2007.
- Pascal Costanza and Robert Hirschfeld, Using Context-oriented Programming for Dynamic Software Evolution, BENEVOL 2007: The 6th BELgian-NETHERlands software eVOLution workshop, University of Namur, Belgium, December 13-14, 2007.
- Pascal Costanza, Using Context-oriented Programming for Dynamic Software Evolution, Université catholique de Louvain, IRM seminar, Louvain-la-Neuve, Belgium, January 23, 2008.

- Pascal Costanza, Context-oriented Programming, invited talk, EPITA Research and Development Laboratory, Paris, France, March 26, 2008.
- Pascal Costanza, Generic Functions and the CLOS Metaobject Protocol, AOSD 2008, Brussels, Belgium, March 31, 2008.
- Pascal Costanza and Robert Hirschfeld, Current Developments in Context-oriented Programming, AOSD 2008, Brussels, Belgium, April 2-3, 2008.
- Pascal Costanza, Context-oriented Programming with ContextL, 3rd European Summer School on Aspect-oriented Software Development, Darmstadt, Germany, July 21-25, 2008.

#### Reports

- Pascal Costanza, Günter Kniesel, Katharina Mehner, Elke Pulvermüller, *Tagungsbericht "Aspektorientierung"* (in German), Workshop der Fachgruppe 2.1.9 Objektorientierte Software-Entwicklung der Gesellschaft für Informatik e.V. (GI), Paderborn, 3.-4. Mai 2001, in: GI Softwaretechnik-Trends, Band 21, Heft 2, ISSN 0720-8928, August 2001.
- Pascal Costanza, Günter Kniesel, Katharina Mehner, Elke Pulvermüller, Andreas Speck (eds.), *Second Workshop on Aspect-Oriented Software Development* (GI SIG 2.1.9 – Object-Oriented Software Development), Bonn, February 21-22, 2002, Proceedings, Technical Report, Institute of Computer Science III, University of Bonn, 2002.
- Wolfgang De Meuter, Pasal Costanza, Martine Devos, Dave Thomas, Feyerabend: Redefining Computing (Workshop Report), in: Juan Hernández Núñez, Ana M. D. Moreira (eds.); *Object-Oriented Technology, ECOOP 2002 Workshops and Posters*, Málaga, Spain, June 10-14, 2002, Proceedings, Springer LNCS.
- Pascal Costanza, Günter Kniesel, Armin B. Cremers, *Arbeitsbericht des TAILOR Projekts (CR 65/13)*, Technical Report, Institute of Computer Science III, University of Bonn, 2004.
- Sebastián González, Wolfgang De Meuter, Pascal Costanza, Stéphane Ducasse, Richard Gabriel, and Theo D'Hondt, 2nd Workshop on Object-Oriented Language Engineering for the Post-Java Era: Back to Dynamicity, in: Jacques Malenfant, Bjarte M. Ostvald, *Object-Oriented Technology. ECOOP 2004 Workshop Reader*, Oslo, Norway, June 14-18, 2004, Proceedings, Springer LNCS.
- Christophe Rhodes, Pascal Costanza, Theo D'Hondt, Arthur Lemmens, Report on the "3rd European Lisp Workshop (ELW'06)" at ECOOP'06, in: Mario Südholt, Charles Consel, *Object-Oriented Technology. ECOOP 2006 Workshop Reader*, Nantes, France, July 2006, Proceedings, Springer LNCS.
- Christophe Rhodes, Pascal Costanza, Theo D'Hondt, Arthur Lemmens, Hans Hübner, Report on the "4th European Lisp Workshop (ELW'07)" at ECOOP'07, in: Michael Cebulla, *Object-Oriented Technology. ECOOP 2007 Workshop Reader*, Berlin, Germany, July 2007, Proceedings, Springer LNCS.

#### Posters

- Pascal Costanza, Transmigration of Object Identity: The Programming Language Gilgul, Poster at OOP-SLA 2001, Tampa, Florida, USA, October 2001.
- Michael Austermann, Pascal Costanza, Günter Kniesel, JMangler - A Framework for Load-Time Transformation of Java Programs, Poster at ECOOP 2001, Budapest, Hungary, June 2001.
- Pascal Costanza, Robert Hirschfeld, An Overview of ContextL, Poster at 2nd European Interactive Workshop on Aspects in Software (EIWAS 2005), Vrije Universiteit Brussel, Belgium, September 1-2, 2005.
- Jorge Vallejos, Peter Ebraert, Tom Van Cutsem, Stijn Mostinck, Brecht Desmet, Pascal Costanza, Theo D'Hondt, A Role-Based Implementation of Context-Dependent Communications Using Split Objects, Poster at ECOOP 2006, Nantes, France, July 2006.
- Charlotte Herzeel, Kris Gybels, Pascal Costanza, History-based Aspects Using Temporal Logic for Context Awareness in Pointcuts, Poster at ECOOP 2006, Nantes, France, July 2006.

#### Web Articles

- Pascal Costanza, *Highly Opinionated Guide to Lisp*, <http://p-cos.net/lisp/guide.html>, 2002, revised 2004, 2005.

## Contributions to the scientific landscape

### Journals

#### Reviewer

- Journal on Software and Systems Modeling, Springer Berlin / Heidelberg.
- Journal of Systems and Software, Elsevier B.V.

### Conferences / Symposia

#### Organization

- International Lisp Conference (ILC 2007), Cambridge, UK, April 1-4, 2007 (Conference co-chair).
- Dynamic Languages Symposium 2007 at OOPSLA'07, Montréal, Canada, October 22, 2007 (Program co-chair).
- 1st European Lisp Symposium (ELS'08), Bordeaux, France, May 22-23, 2008 (Program chair).

#### Program Committee

- International Lisp Conference (ILC 2003), New York City, NY, USA, October 12-15, 2003.
- Object-Oriented Programming Languages and Systems (OOPS'04), Special Track at the 19th ACM Symposium on Applied Computing (SAC 2004), March 14-17, 2004, Nicosia, Cyprus.
- Object-Oriented Programming Languages and Systems (OOPS'05), Special Track at the 20th ACM Symposium on Applied Computing (SAC 2005), March 13-17, 2005, Santa Fe, New Mexico, USA.
- Net.ObjectDays 2005, Erfurt, Germany, September 19-22, 2005.
- Object-Oriented Programming Languages and Systems (OOPS'06), Special Track at the 21st ACM Symposium on Applied Computing (SAC 2006), April 23-27, 2006, Dijon, France.
- Net.ObjectDays 2006, Erfurt, Germany, September 18-21, 2006.
- MoDELS 2006, ACM/IEEE 9th International Conference on Model Driven Engineering Languages and Systems, Genoa, Italy, October 1-6, 2006.
- Dynamic Languages Symposium 2006 at OOPSLA'06, Portland, Oregon, USA, October 22, 2006.
- Object-Oriented Programming Languages and Systems (OOPS'07), Special Track at the 22nd ACM Symposium on Applied Computing (SAC 2007), March 11-15, 2007, Seoul, Korea.
- International Conference on Dynamic Languages 2007, Lugano, Switzerland, August 25-31, 2007.
- Object-Oriented Programming Languages and Systems (OOPS'08), Special Track at the 23rd ACM Symposium on Applied Computing (SAC 2008), March 16-20, 2008, Fortaleza, Brazil.
- Programming for Separation of Concerns (PSC'08), Special Track at the 23rd ACM Symposium on Applied Computing (SAC 2008), March 16-20, 2008, Fortaleza, Brazil.
- Dynamic Languages Symposium 2008 at ECOOP 2008, Paphos, Cyprus, July 8, 2008.
- Software Variability: a Programmers' Perspective (SVPP'08), Brussels, Belgium, August 8-9, 2008.
- Object-Oriented Programming Languages and Systems (OOPS'09), Special Track at the 24th ACM Symposium on Applied Computing (SAC 2009), March 8-12, 2009, Honolulu, Hawaii, USA.
- Programming for Separation of Concerns (PSC'09), Special Track at the 24th ACM Symposium on Applied Computing (SAC 2009), March 8-12, 2009, Honolulu, Hawaii, USA.

## Shepherding

- Seventh European Conference on Pattern Languages of Programs (EuroPLoP 2002), Irsee, Germany, July 3-7, 2002.
- Viking PLoP - The First Nordic Conference on Pattern Languages of Programs, Helsingor, Denmark, September 20-22, 2002.
- Eighth European Conference on Pattern Languages of Programs (EuroPLoP 2003), Irsee, Germany, June 25-29, 2003.

## Workshops

### Organization

- Second German Workshop on Aspect-Oriented Software Development, Bonn, Germany, February 21-22, 2002.
- The Feyerabend Workshop - Redefining Computing, held in conjunction with ECOOP 2002 in Málaga, Spain on June 10th, 2002.
- First International Workshop on Unanticipated Software Evolution (USE 2002), held in conjunction with ECOOP 2002 in Málaga, Spain on June 11th, 2002.
- Second International Workshop on Unanticipated Software Evolution (USE 2003), held in conjunction with ETAPS 2003 in Warsaw, Poland, April 6, 2003.
- The Feyerabend Workshop - Redefining Computing, held in conjunction with ETAPS 2003 in Warsaw, Poland, April 12, 2003.
- REPLS Workshop - Reflectively Extensible Programming Languages and Systems (REPLS 2003) at The International Conference on Generative Programming and Component Engineering (GPCE03), Erfurt, Germany, September 22, 2003.
- 1st European Lisp and Scheme Workshop, co-located with ECOOP 2004, June 13, 2004, Oslo, Norway.
- 2nd Workshop on Object-Oriented Language Engineering for the Post-Java Era (PostJava'04), held in conjunction with ECOOP 2004 in Oslo, Norway, June 14, 2004.
- Object Technology for Ambient Intelligence (OT4Aml), held in conjunction with ECOOP 2005, Glasgow, Scotland, July 25, 2005.
- 2nd European Lisp and Scheme Workshop, held in conjunction with ECOOP 2005, Glasgow, Scotland, July 26, 2005.
- Dynamic Languages Day, Brussels, Belgium, February 13, 2006.
- 3rd European Lisp Workshop, held in conjunction with ECOOP 2006, Nantes, France, July 3, 2006.
- 4th European Lisp Workshop, held in conjunction with ECOOP 2007, Berlin, Germany, July 30, 2007.

### Program Committee

- Second IEEE International Workshop on Source Code Analysis and Manipulation (SCAM 2002), Montréal, Canada, October 1st, 2002.
- 3rd Workshop on Aspect-Oriented Software Development, Essen, Germany, March 4-5, 2003.
- Second AOSD Workshop on Aspects, Components, and Patterns for Infrastructure Software (ACP4IS), held in conjunction with AOSD 2003 in Boston, Massachusetts, USA, March 17, 2003.
- Third IEEE International Workshop on Source Code Analysis and Manipulation (SCAM 2003), Amsterdam, Netherlands, September 27th, 2003.
- Adaptive and Evolvable Software Systems: Techniques, Tools, and Applications (AESS), mini-track at the Hawaii International Conference on System Sciences (HICSS), January 5-8, 2004, Big Island, Hawaii, USA.

- Third AOSD Workshop on Aspects, Components, and Patterns for Infrastructure Software (ACP4IS), held at AOSD'04, March 22, 2004, Lancaster, UK.
- European Interactive Workshop on Aspects in Software (EIWAS'04), September 23-24, 2004, Berlin, Germany.
- Dynamic Aspects Workshop (DAW05), held in conjunction with AOSD 2005 in Chicago, USA, March 15, 2005.
- Workshop on Generic Programming 2006 at 11th ACM SIGPLAN International Conference on Functional Programming (ICFP 2006), Portland, Oregon, September 18-20, 2006.
- Dyla 2007: 3rd Workshop on Dynamic Languages and Applications, July 31, 2007, Berlin, Germany, in conjunction with ECOOP 2007.
- VaMoS 2008: Second International Workshop on Variability Modelling of Software-Intensive Systems, Essen, Germany, January 16-18, 2008.
- Workshop on Self-sustaining Systems (S3) 2008, Potsdam, Germany, May 15-16, 2008.
- International Workshop on Advanced Software Development Tools and Techniques, co-located with ECOOP 2008, Paphos, Cyprus, July 8, 2008.
- VaMoS 2009: Third International Workshop on Variability Modelling of Software-Intensive Systems, Sevilla, Spain, January 28-30, 2009.

## Ph.D. Theses

### Co-promotion

- Thomas Cleenewerck, Modularizing Language Constructs: A Reflective Approach, Ph.D. thesis, Vrije Universiteit Brussel, Faculteit Wetenschappen, Vakgroep Informatica, Laboratorium voor Programmeerkunde, July 3, 2007. Promoters: Theo D'Hondt and Pascal Costanza.

### Jury Member

- Sebastián González Montesinos, Programming in Ambience: Gearing up for dynamic adaptation to context, Ph.D. thesis, Université Catholique de Louvain, Ecole Polytechnique de Louvain, Département d'Ingénierie Informatique, October 24, 2008. Promoter: Kim Mens.