

*These proceedings are dedicated to the memory of  
Philippe Facon*

# Preface

These proceedings record the papers presented at the first International Conference of B and Z Users (ZB 2000), held in the historic city of York in the north of England.

B and Z are two important formal methods that share a common conceptual origin; each is widely used in both academia and industry for the specification and verification of both hardware and software systems. Jean-Raymond Abrial is the founder of both approaches, which share a common mathematical basis of set theory. Z was designed mainly for formal *specification* of computer-based systems. Subsequently, B was designed to aid in the formal *development* from a specification to a program. B has tool support for this process. Both approaches aim to *avoid* errors that are otherwise typically discovered and removed, often more expensively, at the testing stage or, worse, remain until after delivery to the customer.

In ZB 2000 the B and Z communities came together to hold a joint conference that simultaneously incorporated the 12th International Conference of Z Users (formerly the Z User Meeting) and the 3rd International Conference on the B Method. Although organized as an integral event, editorial control of the joint conference remained vested in two separate but cooperating programme committees that respectively determined its B and Z aspects, but in a coordinated manner.<sup>1</sup> In particular, a joint meeting was held in March 2000, hosted by South Bank University in London. At this meeting, the programme committees met separately and together to select the papers for the conference. The committees are especially grateful to Janet Aldway and Stella Jimoh of the School of Computing, Information Systems and Mathematics (SCISM) for aiding in the organization and smooth running of this two-day meeting.

The conference benefited from the contributions of a range of distinguished invited speakers drawn from both industry and academia, who addressed significant recent industrial applications of the two methods, as well as important academic advances serving to enhance their potency and widen their applicability. Our invited speakers for ZB 2000 were drawn from France and the United Kingdom, reflecting the roots of B and Z: David Everett (Platform 7, UK), Jean-Louis Lanet (GemPlus Research Laboratory, France), Dominique Méry (Université Henri Poincaré, Nancy, France), and Mike Spivey (Oxford University Computer Laboratory, UK).

Besides its formal sessions the conference featured tool demonstrations, publishers' displays, special tutorials, and other meetings. The conference was also held in conjunction with the IEEE ICFEM 2000 International Conference on Formal Engineering Methods, held at York during the week after ZB 2000. The

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<sup>1</sup> An indication of which Programme Committee accepted a paper is given in the Table of Contents.

co-location of the two conferences was designed to enable some delegates, especially those from abroad, to attend both events at reduced expense.

The location of ZB 2000 at the University of York reflected important work in the area of formal methods at the university, including Z and B. In particular, members of the Department of Computer Science at the University of York had been very active in the establishment of an international ISO Z standard which was nearing completion.

The ZB 2000 conference was jointly organized by the Z User Group (ZUG) and the International B Conference Steering Committee (APCB). The conference was sponsored by Praxis Critical Systems, Daimler-Chrysler AG, IBM, Rolls-Royce plc, and BAE SYSTEMS plc. It was also supported by BCS-FACS. We are grateful to all those who have contributed to the success of the conference.

On-line information concerning the conference is available under the following Uniform Resource Locator (URL):

<http://www.cs.york.ac.uk/zb2000/>

This also provides links to further on-line resources concerning the Z notation and B Method.

We hope that all participants and other interested readers enjoy these proceedings.

August 2000

Jonathan Bowen  
Steve Dunne  
Andy Galloway  
Steve King

## Programme and Organizing Committees

The following people were members of the ZB 2000 Z programme committee:

Chair: Jonathan Bowen, South Bank University, London, UK  
Co-chair: Sam Valentine, University of York, UK  
Ali Abdallah, South Bank University, London, UK  
Paolo Ciancarini, University of Bologna, Italy  
Neville Dean, Anglia Polytechnic University, UK  
John Derrick, The University of Kent at Canterbury, UK  
Andy Evans, University of York, UK  
Andreas Fett, Daimler-Chrysler Research Berlin, Germany  
David Garlan, Carnegie-Mellon University, USA  
Wolfgang Grieskamp, Technical University of Berlin, Germany  
Henri Habrias, University of Nantes, France  
Jonathan Hammond, Praxis Critical Systems, UK  
Ian Hayes, University of Queensland, Australia  
Mike Hinchey, { University of Nebraska at Omaha, USA  
                          { University of Skövde, Sweden  
Mark d'Inverno, University of Westminster, UK  
Jonathan Jacky, University of Washington, USA  
Randolph Johnson, National Security Agency, USA  
Steve King, University of York, UK  
Kevin Lano, King's College, London, UK  
Shaoying Liu, Hiroshima City University, Japan  
Jean-Francois Monin, France Télécom R&D, France  
Fiona Polack, University of York, UK  
Norah Power, University of Limerick, Ireland  
Mark Saaltink, ORA, Ottawa, Canada  
Thomas Santen, { Technical University of Berlin, Germany  
                          { GMD FIRST, Berlin, Germany  
Alf Smith, DERA Malvern, UK  
Susan Stepney, Logica, UK  
David Till, City University, London, UK  
Jim Woodcock, Oxford University, UK  
John Wordsworth, IBM Hursley UK Laboratories, UK

The following served on the ZB 2000 B programme committee:

Chair: Steve Dunne, University of Teesside, UK  
Co-chair: Andy Galloway, University of York, UK  
Christian Attiogbé, University of Nantes, France  
Richard Banach, University of Manchester, UK  
Marc Benveniste, STMicroelectronics, France  
Didier Bert, IMAG, France  
Juan Bicarregui, CLRC Rutherford Appleton Laboratory, UK  
Pierre Bieber, CERT, France  
Michael Butler, University of Southampton, UK  
Jeremy Dick, Quality Systems and Software, UK  
Mark Frappier, University of Sherbrooke, Canada  
Jeremy Jacob, University of York, UK  
Brian Matthews, CLRC Rutherford Appleton Laboratory, UK  
Luis-Fernando Mejia, Alstom, France  
Jean-Marc Meynadier, Matra Transport, France  
Louis Mussat, { Service Central de la Sécurité des Systèmes  
                          { d'Information, France  
Marie-Laure Potet, IMAG, France  
Ken Robinson, The University of New South Wales, Australia  
Steve Schneider, Royal Holloway, UK  
Emil Sekerinski, McMaster University, Canada  
Bill Stoddart, University of Teesside, UK  
Marina Waldén, Åbo Akademi, Finland

At the University of York, the following helped with the local organization in various capacities:

General Chair:	John McDermid
Administration:	Ginny Wilson
Co-chair/Publicity:	Sam Valentine
Co-chair/Publicity:	Andy Galloway
Treasurer:	Jonathan Moffett
Submissions:	Steve King
Local Arrangements:	Darren Buttle
Exhibitions/Sponsorship:	Fiona Polack
Tool Demonstrations:	Ian Toyn
Proceedings:	David Hull
Website:	James Blow

We are especially grateful to the above for their efforts in ensuring the success of the conference.

## External Referees

We are grateful to the following people who aided the programme committees in the reviewing of papers, providing additional specialist expertise:

Pascal André, Institut National Polytechnique, Côte d'Ivoire  
Peter Breuer, Universidad Carlos III de Madrid, Spain  
Michael Cebulla, Technische Universität Berlin, Germany  
Francis Klay, France Télécom R&D, France  
Jean-Yves Lafaye, Université de La Rochelle, France  
Michael Luck, Warwick University, UK  
Ulrich Ultes-Nitsche, University of Southampton, UK

## Sponsors

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BAE SYSTEMS plc  
Daimler-Chrysler AG  
IBM  
Praxis Critical Systems  
Rolls-Royce plc

## Tutorial Programme

The following tutorials were scheduled on the day before the main conference (August 29, 2000):

An Introduction to Object-Z  
*Graeme Smith, University of Queensland, Australia*

A machine-independent approach to real-time refinement  
*Ian Hayes, University of Queensland, Australia*

The B-Method  
*Ib Sørensen and Ken Robinson, B-Core Ltd, UK and University of New South Wales, Australia*