

Dines Bjørner: Research Bibliographical Notes, Biography and Publication List

Professor of Computing Science (Emeritus). Fredsvej 11, DK-2840 Holte, Denmark
Dr.h.c., MAE, MRANS (AB), ACM Fellow, IEEE Fellow

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1 My Research

My research, since my IBM Vienna days, has focused on *computing science*,¹ in particular *programming methodology: on how to construct software*. I was never much for the more foundational side of computing, or as I call it, *computer science*.^{2 3}

I am in particular “smitten” by the question *what is a method* ?. I see a method as a set of principles to be used in the analysis of problems and in the synthesis of solutions to these problems. I see the analysis and synthesis to be based on techniques and tools. The principles are then about the selection and practical use of the analysis and synthesis techniques and tools — research must uncover these principles, techniques and tools. Software engineering textbooks must cover them.⁴ I see a good software development method to be one that provides for efficient development approaches resulting in efficient software that meets customers expectations (and only and exactly those) and software that is correct (that is satisfies its requirements).

From the IBM Vienna days, and for many years after, into the early 1980s, my research interests sprang from a core of semantics of programming languages. It all really started with the PL/I project of the IBM Vienna Laboratory, [167], with a fall out from my work for John Warner Backus, [169], and my work at the IBM ACS/1 Laboratory, [170], being minor precursors. I still am of the strong conviction that every professional software engineer must be strongly versed in the formal and applied aspects of syntax and semantics – with semantics being the “real thing”!

¹By computing science I understand the study of and knowledge about how to construct the “things” that can exist “inside” computers: data and processes.

²By computer science I understand the study of and knowledge about [models of] the “things” that can exist “inside” computers, their mathematical properties.

³And I could never quite understand how anyone would wish to use the composite term *theoretical computer science*.

⁴And I think that my published textbooks cover the concept of methods as outline above, and that my Inter-based lecture notes do likewise.

Gradually, and also under the impression of the work of the members of IFIP Working Groups 2.2 and (notably) 2.3, my interest swung in the direction the software transformation from formal specification to actual code; [162] is, but an early example. Throughout the 1980s I published many papers in this area and also wrote and rewrote, until the end of the 1990s, several rather complete sets of lecture notes based — notably — on my research, the latest version was [135](1987).

Further, and again, gradually, my interest widened to first study the software engineering field of requirements engineering, then onto domain engineering (and, lastly, to its foundations: domain science [5, 15, 4]). Since I was not satisfied with what I read up on requirements engineering I started thinking “programming language semantically”: *what lies “before” requirements engineering?* My answer was, to me, quite obvious: the language of the domain for which the requirements are to be written, therefore we must try understand that language, that is, its semantic types, as much as possible, before we can write down the requirements. Thus was born “my version” of domain engineering. At that time I took up the position as first and founding UN Director of the UN University’s research and post-graduate training center, UNU-IIST. At UNU-IIST we applied the idea of describing domains, also formally, to railways (China), banking (Russia), ministries of finance (Vietnam), telecommunications (The Philippines), etc., and a view emerged, which found a first form in [88] – presented in April 1996 to Academia Europaea’s Informatics Section. My methodology work on domain engineering has developed since and now accounts for most of my publications since the late 1990s.

In my work on domain engineering I “discovered” that core aspects of requirements prescriptions can be “derived” in a systematic, but not formal manner from domain prescriptions, and related back to these in a formal way. This solved the uneasiness I had always had with most of the ‘Requirements Engineering’ literature.

It also took the form of a complete rewrite of [135] into [31, 32, 33](2006). The structure of this 2414 page book took form during a PhD School I lectured at near Minho, Portugal, kindly invited there by Prof. Jose Nuno de Oliveira. But I was not finished with domain engineering in 2006 although it became quite a corner stone of [33]. I wrote many papers and — spurred on by better didactical understandings, improved pedagogical approaches and opportunities to present this in PhD course forms⁵ I wrote, in succession the Internet-based lecture notes [25, 16, 11](2008,2009,2010).

I consider [6] to be the most succinct presentation so far. I wrote the Internet-based lecture notes (for Vienna) [11] based on [6].

2 Bibliographical Notes

The entries, by year, in reverse chronological order, separates *authored books*, *edited book*, *published papers*, (usually Web “published”) *lecture notes*, reports, (usually Web “published”) *development reports*, and *administrative*, in this case UNU-IIST annual, *reports*. For statistics on such typed documents, pls. cf. Page 4.

2.1 Year-by-Year Listing

⁵Univ. Henri Poincaré (Nancy, France, Fall 2007), Techn. Univ. of Graz (Fall 2008), Univ. of Saarland (Spring 2009), Univ. of Edinburgh (Sept.–Oct., 2009), Univ. of Tokyo (Nov.–Dec., 2009), and Techn. Univ. of Vienna (Austria, April, 2010)

- 2011:** Paper(s): [1] Wrote the paper in 2006. Publisher is taking some time!
- 2010:** Paper(s): [2, 3, 4, 5, 6]
 Authored Book(s): [7, 8, 9].
 Chinese translation of my 2006 book.
 Development Report(s): [10]
 Lecture Notes: [11]
- 2009:** Authored Book(s): [12]. Publication of my 2006 JAIST reports.
 Paper(s): [13, 14, 15]
 Lecture Notes: [16]
 Development Report(s): [17, 18]
- 2008:** Authored Book(s): [19, 20, 21]. English republication of my 2006 book.
 Paper(s): [22, 23]
 Lecture Notes: [24, 25, 26]
- 2007:** Paper(s): [27, 28]
 Edited Book(s): [29], Springer's Web page on this book.⁶
 Development Report(s): [30]
- 2006:** Authored Book(s): [31, 32, 33], My Web Page on these books⁷
 Springer's Web pages on these books: Vol.1⁸, Vol.2⁹ and Vol.3¹⁰
 Guide to using these books in nine courses.¹¹
 Report(s): [34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44]
- 2005:** Report(s): [45, 46]
- 2004-2005:** Spent most of the time, at NUS, Singapore, besides lecturing, writing [31, 32, 33].
- 2004:** Paper(s): [47, 48, 49, 50, 51]
- 2003:** Paper(s): [52, 53, 54, 55, 56, 55]
- 2002:** Paper(s): [57, 58, 59, 60, 57, 61, 62]
- 2001:** Paper(s): [63, 64, 65]
- 2000:** Paper(s): [66, 67, 68, 69, 70]
 Report(s): [71]
- 1999:** Paper(s): [72, 73, 74, 75]
 Report(s): [76, 77]
- 1998:** Paper(s): [78, 79, 80, 81, 82, 83]
- 1997:** Paper(s): [84, 85, 86, 87]
- 1996:** Report(s): [88, 89, 90, 91]
 Administrative Report: [92]
- 1995:** Paper(s): [93]
 Report(s): [94, 95, 96]
 Administrative Report: [97]
- 1994:** Paper(s): [98, 99, 100, 101]
 Administrative Report: [102]
- 1993:** Report(s): [103, 104, 105]
 Administrative Report: [106]
- 1992:** Paper(s): [107, 108, 109, 110, 111]
 Administrative Report: [112, 113]
- 1991:** Paper(s): [114, 115, 116, 117]
 Edited Book(s): [118, 119, 120]
- 1990:** Paper(s): [121]
 Edited Book(s): [122]
- 1989:** Paper(s): [123, 124, 125, 126]
- 1988:** Edited Book(s): [127, 128]
- 1987:** Paper(s): [129, 130, 131, 132, 133]
 Edited Book(s): [134]
 Lecture Notes: [135]
- 1986:** Paper(s): [136, 137, 138]
- 1985:** Paper(s): [139]
- 1983:** Paper(s): [140]

⁶<http://www.springer.com/computer/theoretical+computer+science/foundations+of+computations/book/978-3-540-74106-0>

⁷http://www2.imm.dtu.dk/db/Software_Engineering/

⁸<http://www.springer.com/computer/swe/book/978-3-540-21149-5>

⁹<http://www.springer.com/computer/swe/book/978-3-540-21150-1>

¹⁰<http://www.springer.com/computer/swe/book/978-3-540-21151-8>

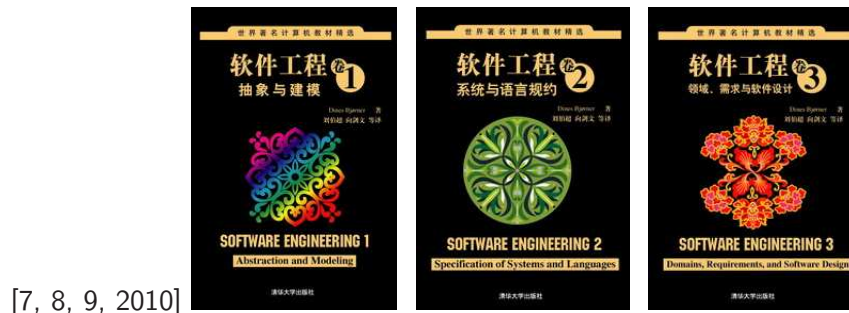
¹¹http://www.imm.dtu.dk/db/Software_Engineering/se-guide.pdf

- 1982: Paper(s): [141, 142, 143, 144, 145, 146]
 Authored Book(s): [147]
 Edited Book(s): [148]
- 1981: Paper(s): [149]
- 1980: Paper(s): [150]
- 1980: Paper(s): [151, 152, 153, 154, 155, 156, 157]
 Edited Book(s): [158, 159]
- 1978: Paper(s): [160, 161, 162, 163]
 Authored Book(s): [164]
- 1977: Paper(s): [165, 166]
- 1974: Report(s): [167]
- 1973: Paper(s): [168]
- 1972: Paper(s): [169]
- 1971: Paper(s): [170]
- 1970: Paper(s): [171, 172, 173, 174, 175, 176]
 Edited Book(s): [177]
- 1969: Report(s): [178]

2.2 Statistics

(co-)Authored Books:	12	Lecture Notes:	6
actually only 6 books,		Reports:	29
3 in 3 versions		Experimental Reports:	4
(co-)Edited Books:	11	Administrative Reports:	7
Published Papers:	112		

2.3 Book Covers



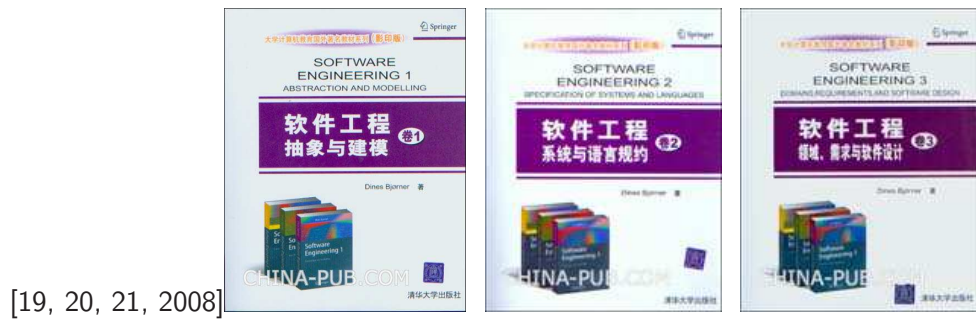
[12, 2009]



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[19, 20, 21, 2008]

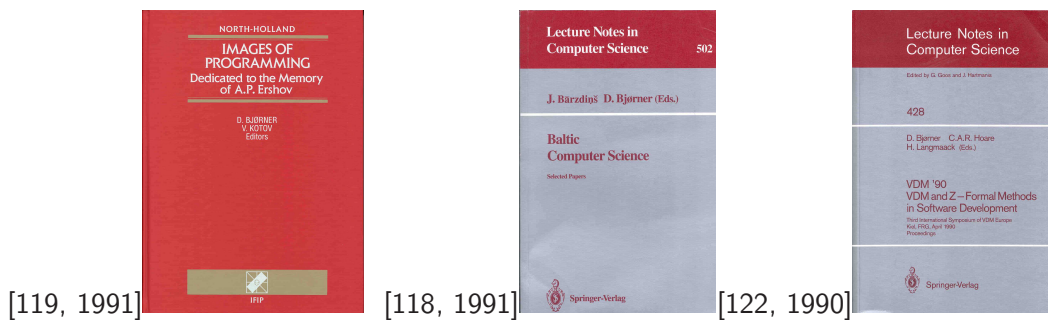


[27, 2007]

[29, 2007]



[31, 32, 33, 2006]



[119, 1991]

[118, 1991]

[122, 1990]



[127, 1988]

[134, 1987]



3 Biography

Family &c.: Dines Bjørner (DB) was born in Odense, Denmark, 4 October 1937. His father had an MSc degree in Mathematics (from Copenhagen University, 1931) and his mother a BA degree in Nordic and Modern English/America Literature (also from Copenhagen University, 1929). Since 1965 DB has been married to Kari Skallerud Bjørner (Oslo, Norway). They have two children, Charlotte and Nikolaj, and five grandchildren.

Educational Background: DB graduated, in 1956, with a senior high school degree in Mathematics and Natural Sciences from the Århus Cathedral School (founded in 1142). DB graduated in January 1962 with an MSc in Electronics Engineering and with a Ph.D. in Computer Science in January 1969 from the Technical University of Denmark (founded by Hans Christian Ørsted in 1828).

IBM Career: DB joined IBM in March 1962 at their Nordic Laboratories (founded by Cai Kinberg) in Stockholm, Sweden (where DB also first met Jean Paul Jacob and Gunnar Wedell). DB was transferred to the IBM Systems Development Division (IBM SDD) at San Jose, California, USA, in December 1963. While doing his Ph.D. (September 1965 – January 1969) DB was a lecturing consultant to IBM's European Systems Research Institute (ESRI) at Geneva, Switzerland (where DB received valuable guidance from Carlo Santacrose and where DB's friendship with Gerald Weinberg started) (1967–1968). In 1969 DB worked at IBM's Advanced Computing Systems (IBM ACS) Laboratory, Menlo Park, California, and, later that year until early 1973 at IBM Re-

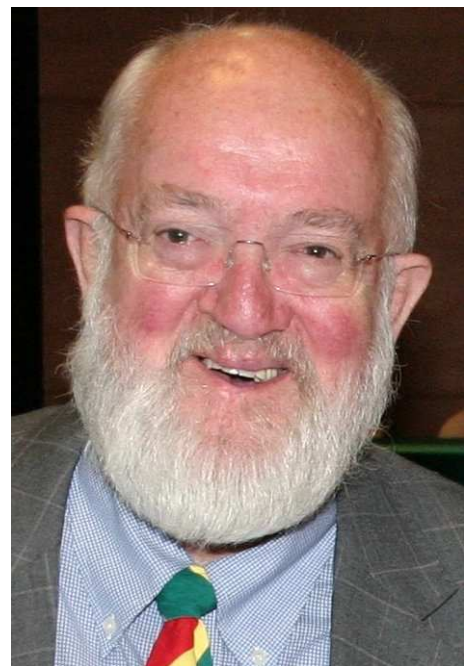


Figure 1: Dines Bjørner, Sept. 2007

search, San Jose (again Jean Paul Jacob became a colleague). Transferred to the IBM Vienna Laboratory (directed then by Heinz Zemanek), Austria, DB resigned from IBM in August 1975 to return to Denmark after basically 13 years abroad.

Career Outside and After IBM: During his stay at IBM Research DB was a visiting lecturer, for several quarters, at University of California at Berkeley (1971–1972), instigated by Lotfi Zadeh whom DB considers his main mentor and for whom DB has the fondest regards. DB was a visiting guest professor at Copenhagen University in the academic year 1975–1976, before taking up his chair in September 1976 at the Technical University of Denmark (DTU). During the summer semester of 1980 DB was the Danish Chair Professor at the Christian-Albrechts University of Kiel, Germany — hosted by Prof. Dr. Hans Langmaack. Together with a colleague, Prof. Christian Gram, DB instigated the Dansk Datamatik Center (DDC) in the summer of 1979. During the 1980s DB was chief scientist of DDC. In 1982–1984 DB was chairman of a Danish Government (Ministry of Education) Commission on Informatics. DB was the founding and first UN Director of UNU-IIST, the United Nations University's International Institute for Software Technology, located in Macau. DB was a visiting professor at NUS: National University of Singapore in the academic year 2004–2005, and a research guest professor at JAIST, Japan Advanced Institute of Science and Technology, Ishikawa Prefecture, Japan for basically the calendar year 2006.

Lectures and Graduates: DB has lectured and regularly lectures on six continents in almost 50 countries and territories and has advised more than 130 MSc's and some two dozen PhDs.

DB was a visiting professor at Université Henri Poincaré and at INRIA/LORIA, Nancy, France (Oct.–Dec. 2007). During the fall and spring of 2008–2009 DB was lecturing at the Techn. Univ. of Graz, Austria (Oct.–Dec.) and at University of Saarland, Saarbrücken, Germany (March). DB was a distinguished SICSA visitor at the University of Edinburgh (Sept.–Oct. 2009) and a visiting guest professor at Tokyo University, Japan (Nov.–Dec. 2009). In April 2010 DB was a visiting professor at the Technical University of Vienna, Austria. For the fall of 2010 lectures are planned at Uppsala Univ., Sweden (Oct.) and Eötvös Loránd Univ., Budapest (Oct.–Nov.).

Research &c. Work: At IBM DB first worked in the hardware (logic and systems) design of such equipment as the IBM 1070 (Sweden), the IBM 1800 and IBM 1130 computers (San Jose), and, finally, with Gene Amdahl and Ed Sussenguth, on the IBM ACS/1 supercomputer (Menlo Park). At Research DB worked with the late John W. Backus and the late Ted Codd on Functional Languages, resp. Relational Data Base Systems. At Vienna, DB, together with such colleagues as Peter Lucas, the late Hans Bekič, Kurt Walk, and Cliff B. Jones, worked on a Denotational (–like) Semantics Description of PL/I while, with his colleagues conceiving, researching, developing and using VDM (the Vienna software Development Method). At DTU and at DDC, supported by the European Community, DB initiated several advanced research & development projects: (1) Formal Semantics Description of and (2) full language Compiler for CHILL (the Intl. Telecommunications Unions Communications [C.C.I.T.T.] High Level Language) — both significantly developed by Peter L. Haff (and the late Søren Prehn); (3) Formal Semantics Description of and (4) the first European US DoD officially validated Compiler for the US DoD Ada embedded systems programming language — with significant and indispensable contributions by DB's colleagues Dr. Hans Bruun, Dr. Ole N. Oest and, again, the late Søren Prehn; (5) RAISE (Rigorous Approach to Industrial Software Engineering, headed by the late Søren Prehn and Chris George); (6) Formal Semantics Definition of VDM–SL (the VDM Specification Language, Bo Stig Hansen and Peter Gorm Larsen); (7) ProCoS (Provably Correct Systems) with, amongst others, Profs. Sir Tony Hoare (then Oxford, now Microsoft Research, Cambridge, UK), Hans Langmaack (Kiel) and Ernst-Rüdiger Olderog (Oldenburg) and others.

UNU-IIST: At UNU-IIST DB had a rather free hand, and was able, with a small team of excellent colleagues (Prof. Zhou Chaochen (Academician, the Chinese Academy of Science), the late Søren Prehn, Chris W. George, Richard Moore, Tomasz Janowski, Dang Van Hung, Xu Qi Wen and Kees Middelburg), to further explore the research issues still occupying DB's interest, and to apply them in a number of joint R&D projects with institutions in developing and newly industrialised countries [including newly independent states] (Argentina, Belarus, Brasil, Cameroun, China, Gabon, India, Indonesia, Mongolia, North Korea, Pakistan, Philippines, Poland, Romania, Russia, South Africa, South Korea, Thailand, Vietnam, Ukraine, Uruguay, etc.).

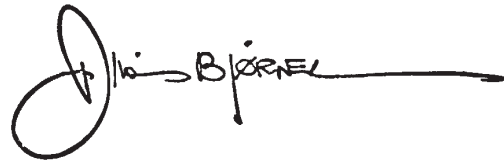
Societal Work: DB was a co-founder of VDM-Europe in 1987 and moved VDM-Europe onto FME: Formal Methods Europe in 1991. DB co-chaired two of the VDM Symposia (1987, 1990), and the International Conference on Software Engineering (ICSE) in 1989 in Pittsburgh, Pennsylvania, USA. DB was chairman of the IFIP World Congress in Dublin, Ireland in 1986, and was the instigator and General Chairman of the first World Congress on Formal Methods, FM'99, in Toulouse, France, September 20–24, 1999. DB was chairman of Academia Europaea's Informatics Section 2004–2009. DB has otherwise been involved in about 60 other scientific conferences. DB is a member of the parish council of the Virum (Lutheran Protestant Danish Folk) Church.

Awards &c.: DB is a Knight of The Danish Flag; is a member of Academia Europaea (MAE); is a member of The Russian Academy of Natural Sciences (MRANS [AB]), and was a member of IFIP Working Groups 2.2 (1980-2004) and 2.3 (1980-2008). DB has received the John von Neumann Medal of the JvN Society of Hungary and the Ths. Masaryk Gold Medal from the Masaryk University, Brno, The Czech Republic. DB received the Danish Engineering Society's (IDA) Informatics Division's (IDA-IT) first BIT prize, March 1999. DB was given the degree of honorary doctor from the Masaryk University, Brno, The Czech Republic, in 2004. DB is an ACM Fellow and an IEEE Fellow.

Publications: DB has published more than a hundred papers, authored 4 books (3 in both English and Chinese, and 1 in two English editions), co-authored 2 books and edited & co-edited 11 books. These publications, reports, etc., are included in the 179 entry bibliography, Pages 9–24.

Research Interests: DB's research interests, since his Vienna days, have centered on programming methodology: *methods as sets of principles for selecting and applying mathematics-based analysis and construction techniques and tools in order efficiently to construct efficient artefacts* — notably software. DB sees his main contributions to be in the research, development and propagation of formal specification principles and techniques. Currently DB focuses on the triptych of (1) domain engineering, (2) requirements engineering and (3) software design methods — emphasising such that relate these in mathematical as well as technical ways: (1) intrinsic, support technology, management & organisation, rules & regulation, and human behaviour facets of domains; and (2) projection, instantiation, extension and initialisation of domain requirements, etc.

Acknowledgements: Among the very many people for whom DB has a special, professional fondness, people who have helped DB in his professional career, he wishes to bear tribute, in approximate chronological order, to (the late) Cai Kinberg, Gunnar Wedell, Jean Paul Jacob, Gerald Weinberg, Gene Amdahl, Ed Sussenguth, Tien Chi (T.C.) Chen, Lotfi Zadeh, (the late) Ted Codd, (the late) John W. Backus, Peter Lucas, Cliff Jones, (the late) Hans Bekič, Kurt Walk, Christian Gram, Ole N. Oest, Erich Neuhold, (the late) Søren Prehn, Sir Tony Hoare, Hans Langmaack, Larry Druffel, Zhou Chao Chen and Chris George.



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Abstract: *From computing science to software technology by means of professional software engineering was, for 17 years: 1992–2009, the motto of UNU-IIST, the UN University's International Institute for Software Technology. UNU-IIST is based in Macau, as always Chinese Territory, but from around 1557 till December 20, 1999 under Portuguese Administration. This paper tells story of the first five years of UNU-IIST, 1992-1997 and reviews its continuation: 1997–2009. The story is biased, being, as it is, told by the first and founding director of UNU-IIST. But for twelve years, after the first five years, UNU-IIST basically kept to its initial devices: if it works, don't fix it !. Now, as from 2010, it seems that UNU-IIST is being drastically redirected. So now the story must be told. We reminisce, in our conclusion, about the "battle", taking place these years, between science, classical, professional engineering and their research, education and training — all efforts which have led to great advances in technology, on one side, and politics and politicians.* August 2010.
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¹²<http://www.imm.dtu.dk/db/bsm.pdf>

¹³<http://www.imm.dtu.dk/db/kiev-p1.pdf>

¹⁴<http://www.imm.dtu.dk/db/kiev-p2.pdf>

¹⁵<http://www.imm.dtu.dk/db/facs-domain.pdf>

¹⁶<http://www.imm.dtu.dk/db/from-domains-to-requirements.pdf>

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¹⁷<http://www2.imm.dtu.dk/db/todai/tse-1.pdf>

¹⁸<http://www2.imm.dtu.dk/db/todai/tse-2.pdf>

¹⁹<http://www.complang.tuwien.ac.at/bjorner/book.pdf>

²⁰<http://www.imm.dtu.dk/db/from-domains-to-requirements.pdf>

²¹<http://www.imm.dtu.dk/db/jaistmono.pdf>

²²<http://www2.imm.dtu.dk/db/bjorner-hoare75-p.pdf>

²³<http://www.imm.dtu.dk/db/db-psi09-paper.pdf>

²⁴<http://www.imm.dtu.dk/db/domain.pdf>

²⁵<http://www.imm.dtu.dk/db/de+re-p.pdf>

²⁶<http://www2.imm.dtu.dk/db/pipeline.pdf>

²⁷<http://www2.imm.dtu.dk/~db/pipeline.pdf>

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²⁸<http://www.imm.dtu.dk/db/montanari.pdf>

²⁹<http://www2.imm.dtu.dk/db/wpdr.pdf>

³⁰<http://www.imm.dtu.dk/db/lipari-paper.pdf>

³¹<http://www.imm.dtu.dk/db/tseb.pdf>

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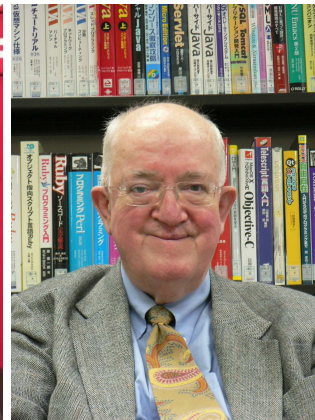
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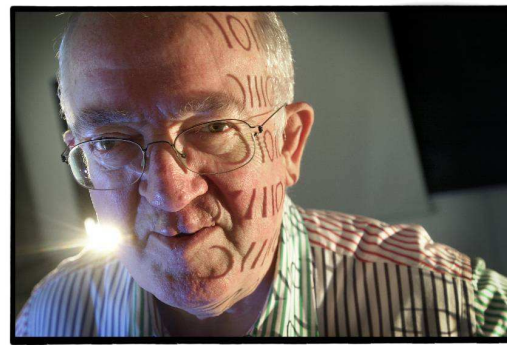
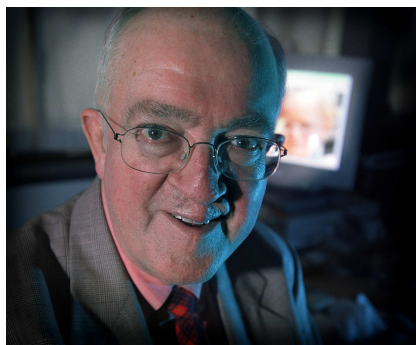
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Puerto Montt, Chile



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Techn.Univ., DK



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JAIST, Japan



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