

CSC 7003 : Basics of Software Engineering

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<http://www-public.it-sudparis.eu/~gibson/Teaching/CSC7003/>

History of Software Engineering

<http://www-public.it-sudparis.eu/~gibson/Teaching/CSC7003/L4-HistorySoftEng.pdf>

How to View/ Structure the History

- People
- Publications
- Companies and Products
- Dates and Interdependencies
- ...

The Important People Can Be Used to Structure the History

A good place to start is with « prizes » for individuals:

- **Association for Computing Machinery**

- ACM Turing Prize Winners: like the Nobel prize for **Computing**
- ACM SIGSOFT (Special Interest Group Software Engineering) Outstanding Research Award
- ACM Software System Award Recipients

- **Institute of Electrical and Electronics Engineers**

- IEEE Technical Council on Software Engineering (Harlan D Mills Award)
- IEEE Fellows

- **American Academy of Arts and Sciences Fellows**

ACM Turing Prize Winners: like the Nobel prize for **Computing**

« an individual selected for contributions of a technical nature made to the computing community. The contributions should be of lasting and major technical importance to the **computer field** » .

QUESTIONS:

- Which winners can you name?
- Which have most contributed to the discipline of **Software Engineering**?

ACM Turing Prize Winners: like the Nobel prize for **Computing**

Of note:

1966 A.J. Perlis

1974 Donald E. Knuth

1978 Robert W. Floyd

1980 C. Antony R. Hoare

1986 John Hopcroft

1995 Manuel Blum

1999 Frederick P. Brooks

2003 Alan Kay

2006 Frances E Allen

2007 Edmund M Clarke E Allen Emerson Joseph Sifakis

2008 Barbara H Liskov

1972 E.W. Dijkstra

1977 John Backus

1979 Kenneth E. Iverson

1984 **Niklaus Wirth**

1991 **Robin Milner**

1996 Amir Pnueli

2001 Ole-Johan Dahl Kristen Nygaard

2005 Peter Naur

ACM Software System Award Recipients

(Related to Software Engineering & Program Language)

1987 Adele Goldberg Daniel H.H. Ingalls Alan C. Kay *Smalltalk*

1992 Daniel G. Bobrow Richard R. Burton L. Peter Deutsch Ronald M. Kaplan Larry Masinter Warren Teitelman *Interlisp*

2001 Gerard Holzmann *SPIN*

2002 James A. Gosling *Java*

2003 Stuart Feldman *MAKE*

2005 Robert S Boyer Matt Kaufmann J Strother Moore *The Boyer-Moore Theorem Prover*

2006 Bertrand Meyer *Eiffel*

2007 David Harel Hagi Lachover Amnon Naamad Amir Pnueli Michal Politi Rivi Sherman Mark Trakhtenbrot Aron Trauring

ACM SIGSOFT Outstanding Research Award

2010/11	Richard N. Taylor
2008	Axel van Lamsweerde
2007	Elaine J. Weyuker
2006	David Harel
2005	Jeff Kramer and Jeff Magee
2004	Nancy Leveson
2003	Leon J. Osterweil
2002	Gerard Holzmann
2001	Michael Jackson
2000	Victor Basili
1999	Harlan Mills
1999	Niklaus Wirth
1998	David Parnas
1997	Barry Boehm

This award is presented to an individual who has made significant and lasting research contributions to the **theory or practice of software engineering.**

IEEE Technical Council on Software Engineering (**Harlan D Mills Award**)

1999 David Parnas

2000 Barry Boehm

2001 Manny Lehman

2002 Jesse Poore

2003 Victor Basili

2004 Elaine Weyuker

Question: do you know why the award is named for
Harlan D. Mills (May 14, 1919 — January 8, 1996) ?

IEEE Fellows: related to Software Engineering or Program Languages/Compilers:

“A member who has made a significant contribution to any of the IEEE fields of interest may be elevated to the grade *IEEE Fellow*, a distinctive honor”

1968: Marvin Minsky (MIT)

1970: Heinz Zemanek (IBM)

1972: Watts S. Humphrey (CMU SEI)
U.)

1973: Stephen S. Yau (Arizona State U.)

1978: CV Ramamoorthy (UC Berkeley)

1983: Manuel Blum (UC Berkeley)

1985: Per Brinch Hansen (Syracuse U.) David J. Kuck (Intel)

1986: Manny Lehman (Middlesex U.)

1987: John D. Musa (Independent Consultant)

1988: Alfred V. Aho (Columbia U.) Laszlo A. (Les) Belady (Tech Innovation Group) Fred Liguori

1989: Amrit Goel (Syracuse U.) William Wulf (U. Virginia)

IEEE Fellows: related to Software Engineering or Program Languages/Compilers:

1990: Victor Basili (U. Maryland)

1991: Frances Allen (IBM Research) Stuart Feldman (IBM Research) John L. Hennessy (Stanford U.) Jack Minker (U. Maryland) William E. Riddle (CMU SEI) Larry Ruffel (SCRA)

1992: Barry W. Boehm (USC) Larry Snyder (U. Washington)

1993: Michael A. Harrison (UC Berkeley) Norman Schneidewind (Naval Postgraduate School)

1994: Wen-Tsuen Chen Alan Davis (U. Colorado)

1995: Arvind (MIT) Brent Hailpern (IBM Research) Ken Kennedy (Rice U.)

1996: Peter Freeman (Georgia Tech) Harold Lawson, Jr. Jeffrey Tsai (U. Illinois at Chicago) Tony Wasserman (Software Methods&Tools)

1997: Ram Chillarege (Chillarege) Anita Jones (U. Virginia) Eric Kronstadt (IBM Research) Marvin Zelkowitz (U. Maryland)

1998: Doris L. Carver (Louisiana State U.) Wen-Mei Hwu (UIUC) Liu Sha (UIUC) Dick Simmons (TAMU) Pen-Chung Yew (UMN)

1999: Jean-Luc Gaudiot (UC Irvine) Luqi (Naval Postgraduate School) Rudrapatna Shyamasundar (Tata Institute of Fundamental Research)

IEEE Fellows: related to Software Engineering or Program Languages/Compilers:

2000: Tom DeMarco (Atlantic Systems Guild) David Padua (UIUC) Koji Torii (Osaka U.)

2001: Karl Chang (Iowa State U.) William E. Howden (UCSD) Sy-Yen Kuo (National Taiwan U.) Richard H. Thayer (Independent Consultant) Mladen A. Vouk (NCSU)

2002: Gul Agha (UIUC) Vijay Vaishnavi (Georgia State U.)

2003: Steve Cross (CMU SEI) Susan Eggers (U. Washington) H. Dieter Rombach (Technische U. Kaiserslautern) Leonard L. Tripp (Boeing) Elaine J. Weyuker (AT&T Labs) Jeannette M. Wing (CMU) Xin Yao (U. Birmingham) Fuqing Yang (Peking U.)

2004: Pankaj Jalote (IIT) Michael Lyu (CUHK) Raymond Paul (?) Ronald H Perrott (Queen's U. Belfast) Mark Wegman (IBM Research)

2005: Dines Bjørner (U. Denmark) Roy Campbell (UIUC) Edmund Clarke (CMU) Thomas M. Conte (NCSU) Jeanne Ferrante (UCSD) Hoang Pham (Rutgers U.) Alfred Z. Spector (IBM Research) Bjarne Stroustrup (TAMU)

2006: Carlo Ghezzi (Politecnico di Milano) Thomas Henzinger (EPFL) Nancy Mead (CMU) James Moore (Mitre) Douglas Post (LANL) David Rosenblum (U. College London) Min Xie (National U. Singapore)

2007: Bill Curtis (Borland) Mehdi Jazayeri (U. Lugano, Switzerland)

2008: Rajeev Alur (U. Penn) Guang R. Gao (U. Delaware) Michael Gschwind (IBM Research) Rajiv Gupta (UC Riverside) Phillip A. Laplante (PSU) David Notki (U. Washington) Anand Tripathi (U. Minnesota)

American Academy of Arts and Sciences Fellows (related to Software Engineering or Program Languages/Compilers):

An international learned society (USA oriented) composed of the world's leading scientists, scholars, artists, business people, and public leaders

Dana S. Scott (CMU, 72) Donald E. Knuth (Stanford U., 73)

John McCarthy (Stanford U., 74) Frederick P. Brooks (UNC, 76)

John Backus (??, 85) John Hopcroft (Columbia U., 87)

Albert R. Meyer (MIT, 87) Bill Gates (Microsoft, 92)

Barbara Liskov (MIT, 92) Frances E. Allen (IBM Research, 94)

Alan Kay (Viewpoints Research, 94) Manuel Blum (UC Berkeley, 95)

Susan Graham (UC Berkeley, 95) William A. Wulf (U. Virginia, 95)

Gerald J. Sussman (MIT, 96) Steven Jobs (Apple, 00)

Anita K. Jones (U. Virginia, 00) Guy L. Steele, Jr. (Sun, 02)

Alfred V. Aho (Columbia U., 03) Richard M. Stallman (Free Software Foundation, 03)

John Guttag (MIT, 05)

Publications: The ICSE "Best Paper from 10 ICSEs Ago" Award

Every ICSE (since the 11th, of course) a paper from the 10th-previous ICSE has been selected for an award. Naturally, this is flawed as a measure of classic papers -- not all outstanding, influential papers appeared in ICSE, and there clearly isn't exactly one outstanding paper per conference.

1989 Marc J. Rochkind: *The Source Code Control System*, NCSE-1, 1975.

1990 William A. Wulf, Ralph L. London, Mary Shaw: *An Introduction to the Construction and Verification of Alphard Programs*, ICSE-2, 1976.

1991 **David Parnas**: *Designing Software for Ease of Extension and Contraction*, ICSE-3, 1978.

1992 Walter Tichy: *Software Development Control Based on Module Interconnection*, ICSE-4, 1979.

1993 Mark Weiser: *Program Slicing*, ICSE-5, 1981.

1994 Sol Greenspan, John Mylopoulos, Alex Borgida: *Capturing More World Knowledge in the Requirements Specification*, ICSE-6, 1982.

1995 **David L. Parnas**, Paul C. Clements, David M. Weiss: *The Modular Structure of Complex Systems*, ICSE-7, 1984.

Publications: The ICSE "Best Paper from 10 ICSEs Ago" Award

1996 Sam Redwine Jr., William Riddle: *Software Technology Maturation*, ICSE-8, 1985.

1997 Lee Osterweil: *Software Processes are Software Too*, ICSE-9, 1987.

Manny Lehman: *Process Models, Process Programs, Programming Support*, ICSE-9, 1987.

1998 David Harel, Hagi Lachover, Amnon Naamad, Amir Pnueli, Michal Politi, Rivi Sherman, Aharon Shtul-Trauring: *Statemate: A Working Environment for the Development of Complex Reactive Systems*, ICSE-10, 1988.

1999 Dewayne Perry: *The Inscape Environment*, ICSE-11, 1989.

2000 no award

2001 Robert Balzer: *Tolerating Inconsistency*, ICSE-13, 1991..

2002 David S. Rosenblum: *Towards a Method of Programming with Assertions*, ICSE-14, 1992.

2003 Bashar Nuseibeh, Jeff Kramer, Anthony Finkelstein: *Expressing the Relationships between Multiple Views in Requirements Specification*, ICSE-15, 1993.

2004 Robert Allen, David Garlan: *Formalizing Architectural Connection*, ICSE-16, 1994.

Publications: The Dagstuhl on History of Software Engineering Informal Poll

In 1996 a collection of software engineers and historians of computing spent a week discussing the history of software engineering. Albert Endres polled the assembled multitude for their nominations for "classic software engineering papers."

Most often named, in order

Brooks: *No Silver Bullet*

Dijkstra: *THE*

Parnas: *Information Aspects of Information Hiding* IFIP '71

Parnas: *Decomposing Systems*

Lehmann: *Laws of SW Evolution*

Boehm: *Software Engineering*

Boehm: *Spiral Model*

DeRemer/Kron: *Programming in the Large*

Henninger: *Specifying Complex Systems*

Brooks: *Mythical Man Month*

Belady/Lehmann: *Charact. of Large Systems*

Parnas: *Role of Specification*

Companies and Products – do you know their history?

Forbes 2000

1. Sony
2. Microsoft
3. Apple
4. Oracle Corporation
5. Google
6. Softbank
7. SAP AG
8. Accenture
9. Computer Sciences Corporation
10. Yahoo!

The Software 500 by Software Magazine

1. Sony
2. Microsoft
3. Apple
4. Accenture
5. HP
6. Oracle Corporation
7. SAP
8. Computer Sciences Corporation
9. LAYA IT service pvt ltd
10. Lockheed Martin Corporation

The Software Top 100

1. Microsoft
2. IBM
3. Oracle Corporation
4. SAP
5. Nintendo
6. HP
7. Symantec
8. Activision Blizzard
9. Electronic Arts
10. CA, Inc

Companies and **Products** - do you know their history?

Operating Systems:

- Windows DOS
- Unix : Linux, Sun OS-Solaris, Mac OS X
- Embedded : Symbian OS, Palm OS, BSD

Compilers/Languages:

- OO – C++, Java, ...
- YACC, Bison, Lex
- Functional/Logical
- Databases
- Mathematica, Matlab, Minitab

Other Key Areas:

- Personal Applications
- Video Games
- Embedded/Firmware
- MiddleWare
- Web Sites/Services/Protocols
- Multimedia Players/Coding
- Software Development
- Simulation/Modelling
- Enterprise Software

Open Source:

OSS, GNU, FSF, OSI

Dates and Interdependencies – A temporal sequence

A selection of interesting happenings

1960s

1960: Algol - first structured, procedural, programming language to be released; and first *compiler compiler*

1962: Spacewar!, the first computer game is written by MIT student Steve Russell.

1965: BASIC programming language (Beginners All Purpose Symbolic Instruction Code) developed at Dartmouth College, USA, by Thomas E. Kurtz and John Kemeny.

1968-69: The NATO Science Committee sponsored two conferences on software engineering in 1968 (Garmisch, Germany — see conference report) and 1969, which gave the field its initial boost. Many believe these conferences marked the official start of the profession of software engineering.

Dates and Interdependencies – A temporal sequence

1970s

1970 Forth programming language developed. A simple, clean, stackbased design, which later inspired PostScript and the Java virtual machine.

1972 Pong released - widely recognised as the first popular arcade video game. It was invented by Allan Alcorn.

1972 Smalltalk Programming Language at Xerox Parc

1972 C programming language developed at The Bell Laboratories in the USA by Dennis Ritchie; and The first international connections to ARPANET are established. ARPANET later became the basis for what we now call the Internet.

1973 Development of the TCP/IP protocol suite by a group headed by Vinton Cerf and Robert E. Kahn. These are the protocols used on the internet; and Ethernet developed.

1975 First microcomputer implementation of BASIC by Bill Gates and Paul Allen, it was written for the MITS Altair - the first personal computer - this led to the formation of Microsoft later in the year.

1977 Apple II computer released

Dates and Interdependencies – A temporal sequence

1980s

1980 Development of MS-DOS/PC-DOS began. Microsoft (known mainly for their programming languages) were commissioned to write the Operating System for the PC

1983 Apple introduced its Lisa. The first personal computer with a graphical user interface. (Inspired by Xerox Star and Smalltalk)

1983 C++ (Stroustrup) – C with classes

1984 Richard Stallman quit his job at MIT in order to start the GNU project, a free and improved replacement for Unix

1985 Windows launched by Microsoft

1986 Fred Brooks published the *No Silver Bullet* article, arguing that no individual technology or practice would ever make a 10-fold improvement in productivity within 10 years

1987 Perl Programming Language

1989 World Wide Web, invented by Tim Berners-Lee

Dates and Interdependencies – A temporal sequence

1990 Phil Zimmermann releases the public key encryption program PGP along with its source code, which quickly appears on the Internet.

1990 The Linux kernel is born with the following post to the Usenet Newsgroup comp.os.minix by Linus Torvalds, a Finnish college student

1991 Visual Basic (Alan Cooper) sold to Microsoft

1994 Peter Shor devises an algorithm which lets quantum computers determine the factorization of large integers quickly.

1994 Object Modelling Unified Rumbaugh's OMT, which was better for object-oriented analysis (OOA), and Grady Booch's Booch method, which was better for object-oriented design (OOD)

1995 Sun Microsystems first announces Java at the SunWorld conference.

1997 UML 1 released

1998 Standard C++ (ISO) and beginning of Eclipse (IBM)

Dates and Interdependencies – A temporal sequence

2000s

2000 C# - Anders Hejlsberg at Microsoft (ECMA)

2001 AspectJ - Xerox PARC, and Visual Basic .NET by Microsoft

2001 The Agile Manifesto is drafted as a statement of the principles that underpin agile software development.

2005 IBM introduce service oriented architecture

2005 UML2

QUESTION: What you would add for years 2005-2010?

Dates and Interdependencies – A temporal sequence

The Future of software engineering?

Aspects

Agile

Cloud

Experimental

Grid

Models

Multicore

Services

SPLs

Ubiquitous/Autonomous/Intelligent

QUESTION: What are the most important research questions that need to be answered?

QUESTION: What are the most important software engineering *tools* under development