## The Greatest Pioneers in Computer Science



Ivan Srba, Veronika Gondová

19th October 2017



### 5<sup>th</sup> Heidelberg Laureate Forum

Laureates of mathematics and computer science meet the next generation

September 24-29, 2017, Heidelberg

https://www.heidelberg-laureate-forum.org

HEIDELBERG LAUREATE FORUM





### Awards in Computer Science

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- ACM A.M. Turing Award
  - "Nobel Prize of Computing"
  - Awarded to "an individual selected for contributions of a technical nature made to the computing community"
  - Accompanied by a prize of \$1 million



### Awards in Computer Science

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  - Accompanied by a prize of \$1 million
- ACM Prize in Computing
  - Awarded to "an early to mid-career fundamental innovative contribution in computing"
  - Accompanied by a prize of \$250,000



### Some of Laureates We Met at 5<sup>th</sup> HLF





Schöne Grüße aus Heidelberg Blick zum Schloss

Logo: © Knösel/Heidelberger Studentenkuss

Heidelberg Laureate Forum Laureates

Ford Broof Sliphon a John Her

meets the next generation

Foto: Pitopia/Thomas Schmid

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Slovatia

PEFC



### Leslie Lamport

ACM A.M. Turing Award (2013)

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Source: https://www.heidelberg-laureate-forum.org/blog/laureate/leslie-lamport/

### Leslie Lamport

#### ACM A.M. Turing Award (2013)

"for fundamental contributions to the theory and practice of distributed and concurrent systems, notably the invention of concepts such as causality and logical clocks, safety and liveness, replicated state machines, and sequential consistency."

- Developed Lamport Clocks for distributed systems
  - The paper "Time, Clocks, and the Ordering of Events in a Distributed System" from 1978 has become one of the most cited works in computer science
- Developed LaTeX
- Invented the first digital signature algorithm

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Currently work in Microsoft Research



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/leslie-lamport/

### Balmer's Peak

- The theory that computer programmers obtain quasi-magical, superhuman coding ability
  - when they have a blood alcohol concentration percentage between 0.129% and 0.138%.
- The discovery of this effect is attributed to Steve Ballmer, CEO of Microsoft
  - who probably "discovered" it by simply monitoring his own perpetually inebriated nervous system, and deducing that programming ability "peaks" after a few drinks and then dips dramatically after full-blown drunkenness ensues.



Unfortunately, not confirmed by Leslie Lamport...

Source: http://www.urbandictionary.com/define.php?term=Ballmer%20Peak

### Ivan Sutherland

ACM A.M. Turing Award (1988)



Eugenite

Source: https://www.heidelberg-laureate-forum.org/blog/laureate/ivan-sutherland/

### Ivan Sutherland

#### ACM A.M. Turing Award (1988)

"for his pioneering and visionary contributions to computer graphics, starting with Sketchpad, and continuing after."

- The first interactive drawing program
- Data structures for storing, accessing, and modifying the drawings on the screen (now common in object-oriented languages)
- The first head-mounted display system in which a user was immersed in images that appear all around
- A proponent of "clockless" design paradigm

Lui Anit



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Source: https://www.heidelberg-laureate-forum.org/blog/laureate/ivan-sutherland/

### Frederick Brooks

ACM A.M. Turing Award (1999)





Source: https://www.heidelberg-laureate-forum.org/blog/laureate/frederick-brooks/

### Frederick Brooks

#### ACM A.M. Turing Award (1999)

"for landmark contributions to computer architecture, operating systems, and software engineering."

- Patented an interrupt system for the IBM Stretch that introduced most features of today's interrupt systems
- Coined the term "computer architecture"
- Summarized his decades of experience in hardware and software development in a book entitled "The Mythical Man-Month"
- "Brooks Law"





Source: https://www.heidelberg-laureate-forum.org/blog/laureate/frederick-brooks/



### Stephen A. Cook

ACM A.M. Turing Award (1982)

Sliphon a. Cook



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/stephen-a-cook/

### Stephen A. Cook

#### ACM A.M. Turing Award (1982)

"for his advancement of our understanding of the complexity of computation in a significant and profound way. His seminal paper, 'The Complexity of Theorem Proving Procedures,' presented at the 1971 ACM SIGACT Symposium on the Theory of Computing, laid the foundations for the theory of NPcompleteness."

• The concept of NP-completeness

Sliphon a. Cool



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/stephen-a-cook/

### Martin Hellman

ACM A.M. Turing Award (2015) with Whitfield Diffie



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Source: https://www.heidelberg-laureate-forum.org/blog/laureate/martin-hellman/

### Martin Hellman

#### ACM A.M. Turing Award (2015) with Whitfield Diffie

"for inventing and promulgating both asymmetric public-key cryptography, including its application to digital signatures, and a practical cryptographic keyexchange method."

- Public-key cryptography
- In the 1980s Hellman's research moved into international security and ways to reduce the risk of a disaster involving nuclear weapons
- Fought for researchers to have the right to freely publish their findings in cryptography



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/martin-hellman/

### Whitfield Diffie

ACM A.M. Turing Award (2015) with Martin Hellman





Source: https://www.heidelberg-laureate-forum.org/blog/laureate/whitfield-diffie/

### Whitfield Diffie

ACM A.M. Turing Award (2015) with Martin Hellman

"for inventing and promulgating both asymmetric public-key cryptography, including its application to digital signatures, and a practical cryptographic keyexchange method."

- Public-key cryptography
- Protected the individual and business right to use encryption

Mutul Diffe



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/whitfield-diffie/

### John E. Hopcroft

ACM A.M. Turing Award (1986) with Robert E. Tarjan

John Heperoft



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/john-e-hopcroft/

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### John E. Hopcroft

#### ACM A.M. Turing Award (1986) with Robert E. Tarjan

"for fundamental achievements in the design and analysis of algorithms and data structures."

- Development of formal languages and automata theory
- He became famous for his textbook of 1969 "Formal Languages and Their Relation to Automata"

John Heperoft



### Vinton Gray Cerf

ACM A.M. Turing Award (2004) with Robert E. Kahn



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/vinton-gray-cerf/

### Vinton Gray Cerf

#### ACM A.M. Turing Award (2004) with Robert E. Kahn

"for pioneering work on internetworking, including the design and implementation of the Internet's basic communications protocols, TCP/IP, and for inspired leadership in networking."

- One of the "Fathers of the Internet"
- Co-designer of the TCP/IP protocols and the architecture of the Internet
- Currently working on inter-planetary Internet



Source: https://www.heidelberg-laureate-forum.org/blog/laureate/vinton-gray-cerf/



### Additional Interesting Program at 5<sup>th</sup> HLF

- HITS Heidelberg Institute for Theoretical Studies
  - HITS conducts basic research in the natural sciences, mathematics and computer science. The research areas range from molecular biology to astrophysics.



# KLAUS TSCHIRA Heidelberg Institute for Theoretical Studies

### Additional Interesting Program at 5<sup>th</sup> HLF

- Hot topic: Quantum Computing
- Workshop on *Matrix Factorization* (in Recommender Systems)
  - Matrix factorization = state of the art in collaborative filtering approaches
- Workshop on The moving frontier between informatics and mathematics
  - Certifying algorithms (Kurt Mehlhorn)
  - Relationship between mathematics and computer science





















6<sup>th</sup> Heidelberg Laureate Forum, September 23 - 28, 2018