Arto Salomaa

A Pioneer of Science

from

Turku

Arto

Turku Cathedral

Arto & Turku

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- Proud of Finnish Sauna, in particular of his Salosauna
- Jealous of those who have never seen “lousy white stuff”

Roots in Turku

Arto and his father J.E. Salomaa, a professor in Philosophy at Turku University

Arto Salomaa 80

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Monday	
9.00 - 9.30	Opening ceremony
9.30 - 10.00	The Internet is great but also dangerous H. Maurer
10.00 - 10.30	Are you smarter than a cucumber? or How to measure and visualize species' relatedness L. Kari
10.30 - 11.00	Coffee break
11.00 - 11.30	Thue systems: an interplay between mathematics and computer science Yu. Matiyasevich
11.30 - 12.00	Understanding quantum randomness C. Calude
12.00 - 14.00	Lunch
14.00 - 14.30	Arto at Western, a friendly giant A. Szilard
14.30 - 15.00	Regularity since 1982 T. Harju
15.00 - 15.30	Coffee break
15.30 - 16.00	The complex state of state complexity J. Brzozowski
16.00 - 16.30	On some coloring problems for infinite words A. de Luca
16.30 - 17.00	Universal pattern generation by cellular automata J. Kari
19.00 -	Dinner

Tuesday	
9.00 - 9.30	Arto Salomaa - pioneer of computer science education J. Hromkovic
9.30 - 10.00	Return words and derived words D. Perrin
10.00 - 10.30	Coffee break
10.30 - 11.00	A new acceptance modus for weighted finite automata W. Kuich
11.00 - 11.30	Matrices and recursively enumerable sets J. Honkala
11.30 - 13.30	Lunch
13.30 - 14.00	Arto Salomaa, the Bourbaki of formal languages S. Marcus
14.00 - 14.30	Networks of Watson-Crick DOL systems: new developments E. Csuhaj-Varjú
14.30 - 15.00	Coffee break
15.00 - 15.30	Desriptional complexity of input-driven pushdown automata K. Salomaa
15.30 - 16.00	My ways to Artolandia G. Paun

Old friends

Portrait of Arto

- Prepared by the University of Arts in the occasion of Arto's 60 year birthday
- One of the first computer-aided portraits in Finland

Contents

1. CAREER
2. SCIENTIST
3. EDUCATOR
4. Ph.D. SUPERVISOR
5. PROMOTOR OF SCIENCE
6. A FAMILY MAN

1 CAREER

2 SCIENTIST

3 EDUCATOR

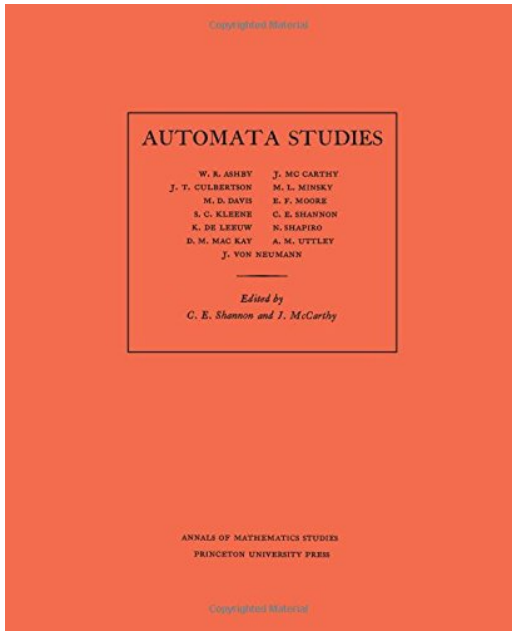
4 Ph.D. SUPERVISOR

5 PROMOTOR OF SCIENCE

6 A FAMILY MAN

Career

- Post graduate studies at Berkeley
  - J. Myhill
  - A. Tarski
- C. Shannon and J. McCarthy, Automata Studies



Career

- Ph.D. in Turku 1960
  - many valued logic!
- First paper in Automata Theory, 1964
  - "Theorems on the representation of events in Moore automata", Annales Universitatis Turkuensis, Ser. A I, 69 (1964), 14 pp.
- Professor at Oulu University 1965
- Professor at Turku University 1966–1998

Career

Visiting professorships:

- Univ. of Western Ontario, London, 1966–1968
- Univ. of Aarhus, 1973–1975
- Univ. of Waterloo, 1981–1982

- Short term visits in more than 150 universities

Career

Each of the visits had a characteristic influence:

- London became the second home of Arto; the first book was written
- Theory of L-systems was created in Aarhus
- Sheng Yu was met in Waterloo

Career

- Academy professor in Finland
  - Arto was appointed three times for five year periods in 1975–1999
- Member of Finnish Academy of Sciences, 1970
- Member of Academia Europaea, 1992
- Academician, 2001
  - One of the altogether 12 science academicians in Finland

Career

May 1971

Arto and Grzegorz Rozenberg met!

1 CAREER

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6 A FAMILY MAN

Scientist

First of all Arto is a

SCIENTIST

Arto has written

- more than 400 scientific articles
- 13 different books
- around 40 collected books

and most amazingly, . . .

Scientist

- more than 100 scientific articles after his retirement!

Scientist

His research interests cover

- many-valued logic
- automata theory
- formal language theory
- combinatorics on words
- cryptography
- bioinspired computing

A few instances of Arto's publications

His first papers were on

- many-valued logic
  - created connections to Moscow school of logic in 1960's (Jablonski)
  - turned out important to Cerny's conjecture after 50 years!

A few influential papers

- "Two complete axiom systems for the algebra of regular events", Journal of the Association for Computing Machinery, 13 (1966) 158–169
  - was rediscovered 30 years later

Importance of morphisms of free monoids:

- "Equality sets for homomorphisms of free monoids", Acta Cybernetica, 4 (1978), 127–139
- (with K. Culik and F.E. Fich) "A homomorphic characterization of regular languages", Discrete Applied Mathematics, 4 (1982) 149–152

Connections of Skolem's Problem and morphic sequences

Initiator of research topics

- Axiomatization of regular events
- L-systems
- Formal power series in automata theory
- Morphic problems
  - (with K. Culik)
    "On the decidability of homomorphism equivalence for languages"
    Journal of Computer and System Sciences, 17 (1978) 163–175
  - (with K. Culik)
    "Test sets and checking words for homomorphism equivalence"
    Journal of Computer and System Sciences, 20 (1980) 379–395
- Public-key cryptography

A team worker

- MSW-team (Maurer–Salomaa–Wood)
  - one of the most productive groups in TCS; influenced, e.g., to E. Welzl

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  - G. Paun, C. Calude, L. Ilie, S. Marcus, I. Petre
- With Sheng Yu
- And, of course, with G. Rozenberg

Internationality

- The most characteristic feature of Arto's research
- Arto was among the first international researchers in Finland, in fact even before the term was "discovered" in Finland
- None of his books has been published in Finnish!

Recognition

- Doctor Honoris Causa, 9 times:
  Åbo, Oulu, Szeged, Bucharest, Magdeburg, Riga, Iasi, Graz and London

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- Special international birthday issues:
  LNCS, Fundamenta Informatica, Information and Computation, Theoret. Comput. Sci., LNCS, LNCS, Theoret. Comput. Sci.

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Educator

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- 12 books in 8 different languages,

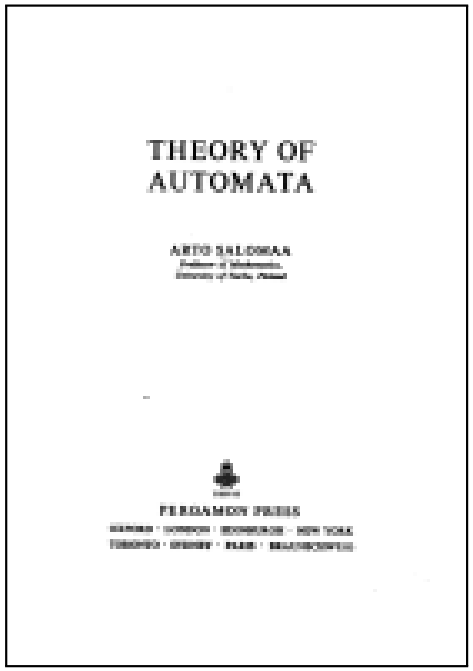
however, none in Finnish or Swedish, so far!

Educator

- Pioneering
- Very well written
- Thematically broad

A few characteristic features

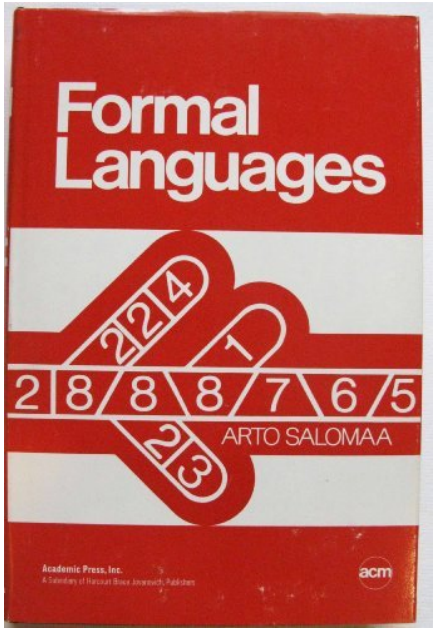
- Theory of Automata, 1969



  - the first book
  - very original even today
  - mishandled by the publisher

A few characteristic features

- Formal languages, 1973



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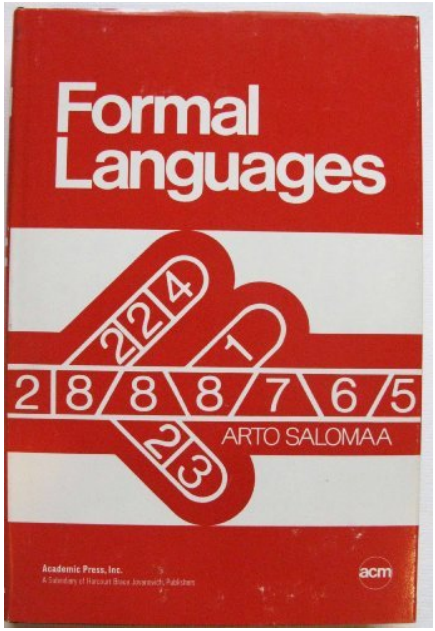
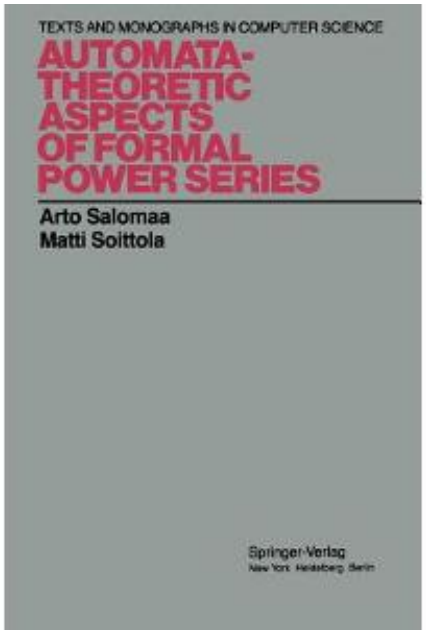


  - a classical masterpiece
  - "among the 100 most cited math-books"
  - created avenues of formal language research for several decades
  - made Arto the "Father of Formal Languages"

Pioneering ones

- Automata-Theoretic Aspects of Formal Power Series, 1978



  - a masterpiece of new aspects and tools in automata theory
  - involved Matti Soittola – a hidden data bank

Pioneering ones

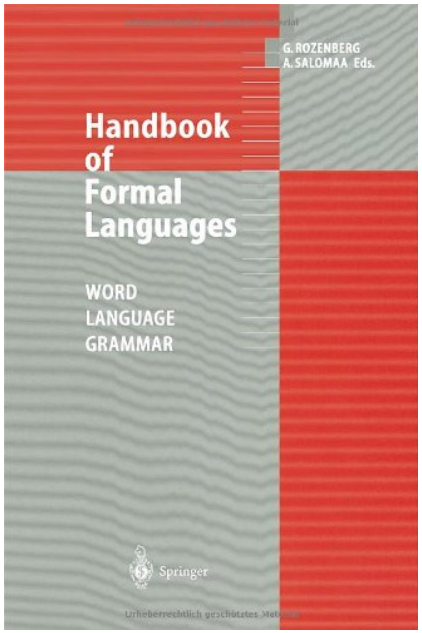
- The Mathematical Theory of L Systems, 1980
  - timely presentation of an active research topic
- Public-Key Cryptography, 1990
  - a new opening to a fascinated field
- DNA Computing. New Computing Paradigms, 1998
  - another challenging topic

Jewels

- Jewels of Formal Language Theory, 1986
  - a jewel, motivated by "Three Pearls of Number Theory" by Khinchin
  - attractive announcement of the beauty of morphic problems
- Cornerstones of Undecidability, 1994
  - undecidability through PCP and Hilbert's 10th Problem
  - continues the praise of morphic problems

Last Symphony

- Handbook of Formal Languages, 1997



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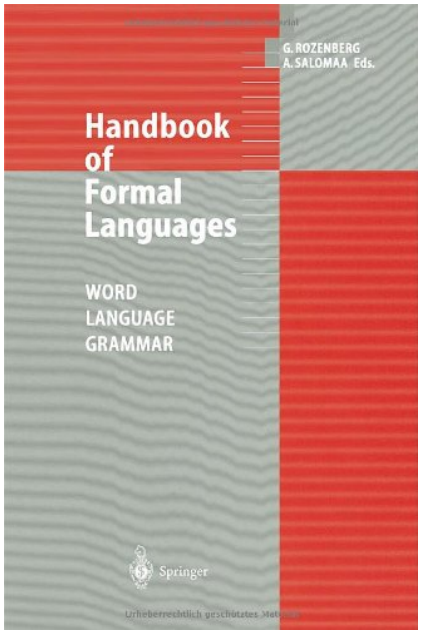

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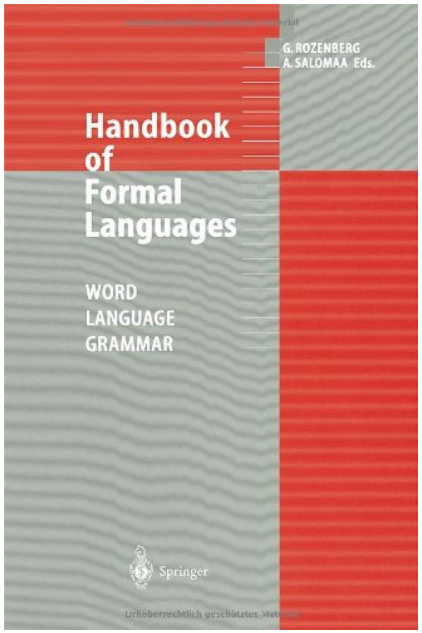

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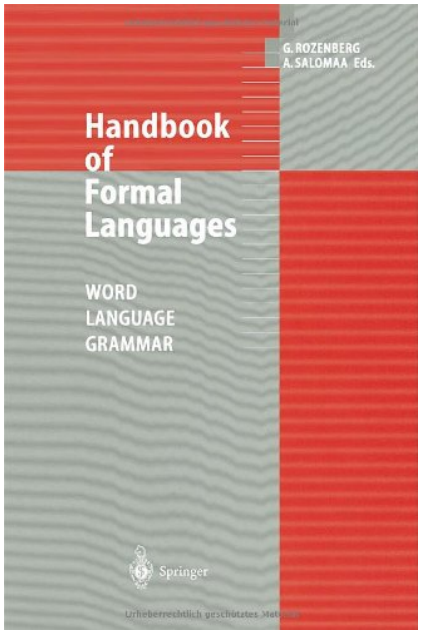

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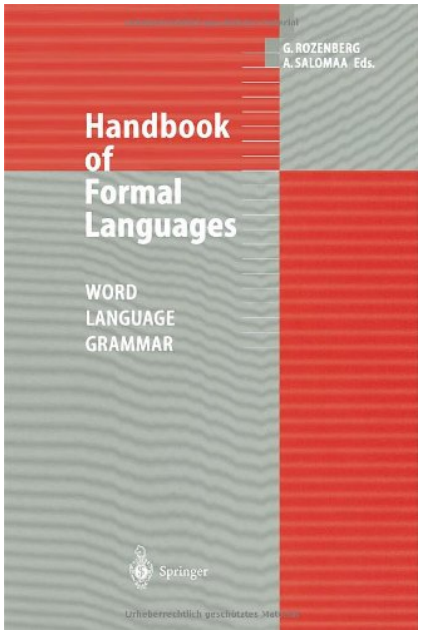

  - three volumes, 2000 pages
  - 51 authors
  - finalized in three and half years
  - MASTERPIECE COLLECTING RESEARCH ACHIEVEMENTS OF 30 YEARS!

Educator

In 80 year symposium:

A golden medal of ETHZ for computer science education

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6 A FAMILY MAN

Supervisor

- Gentle
- Supportive
- Professional

Arto has supervised 24 Ph.D.'s

- in London, Turku and Aarhus
- in the areas of
  - Automata Theory
  - Formal Languages
  - Cryptography
  - Combinatorics on Words

Supervisor

The first ones:

- N. Jones, 1967, London
- P. Turakainen, 1968, Turku

The last ones:

- V. Mihalache, 1998, Turku
- L. Ilie, 1998, Turku

And the total list:

- N. Jones, P. Turakainen, M. Steinby, T. Urponen, A. Szilard, M. Penttonen, S. Skyum, M. Linna, M. Soittola, K. Ruohonen, M. Nielsen, J. Karhumäki, R. Leipälä, T. Harju, J. Honkala, V. Niemi, J. Kari, L. Kari, J. Koskinen, A. Renvall, M. Lipponen, C. Ding, V. Mihalache, L. Ilie

Supervisor

The quality:

- More than two out of three are or have been professors in Canada, Finland, Denmark or Hong Kong

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Promotor

Arto was never an administrator

- He was once asked to become the president of the Academy of Finland, and then he thought this for a short while . . .
  . . . but told later one of the best decisions he has made was to refuse the position

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Instead he was

- a promotor of science in many ways
- an initiator of important developments

Promotor

Arto has

- served in PC's of more than 50 international conferences in TCS; 15 times for ICALP
- been in editorial boards of more than 10 top journals of TCS
- served in a number of evaluation panels of CS for different countries

Promotor

Arto has initiated

- DLT in 1993
- Gödel Prize in 1993
- Nevanlinna Prize in 1982

Promotor

Services to EATCS:

- board member, 1993
- president, 1979
- monograph series editor, 1983

Promotor

Services to EATCS:

- board member, 1993
- president, 1979
- monograph series editor, 1983

He received

- EATCS award, 2004

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The family is extremely important for Arto

Kaarina has followed Arto everywhere for more than 50 years

Earlier:

The family is extremely important for Arto

Kaarina has followed Arto everywhere for more than 50 years

Earlier:

Later:

Kai is continuing Arto's avenue as professor in Queens University

Kirsti is Arto's health advisor

Grandchildren Suvi, Juhani and Daniel are very special to Arto

Arto's triangle bus trips: Turku–Kauhajoki–Rauhala–Turku are wildly known and admired

And last but not least

SALOSAUNA

is an essential part of Arto!

In summer:

And last but not least

SALOSAUNA

is an essential part of Arto!

In summer:

In winter:

THANKS

- to Arto for many pieces of information
- to Kai for pictures
- to A. Saarela for making the presentation