

From Turing to Lamport

Important persons in Computational Logic

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June 10, 2015

1 Introduction

Computational Logic is a very important part of today's computer science and software development, but how did it come to that? The following document gives a short overview about some important persons who were involved in building the foundation of today's Computational Logic and Theoretical Informatics.

2 Alan Turing

2.1 Turing's Life

Alan Mathison Turing was born on June 23th, 1912 in London. With his scientific work, ideas and visions he was a pioneer in Computational Logic and the Theoretical Informatics with great influence on their direction and development during the 20th century. He was a genius and had revolutionary ideas, but often was not acknowledged for his work. Instead of honouring him for his great research results he got sentenced in 1952 to a chemical castration because of his Homosexuality. He was hit very hard by the spoken punishment and got into a deep crisis. Sadly enough Turing committed suicide and died on June 7th, 1954 in Wilmslow.

His research results were only acknowledged lots of years later and became the foundation of modern Computational Logic and Informatics. Since 1967, a prize named after him, the so called **Turing Award**, the "Nobel Prize" of Informatics, is rewarded to scientists in computer science. Alan Turing may have gone early, but he left us a great legacy to tackle.

2.2 Turing's Works

- Having heard of the **Entscheidungsproblem**, he introduced the **Turing Machine** in his paper *On Computable Numbers with an application to the Entscheidungsproblem*.

- In World War II. he assisted in decryption of the Enigma by joining the British cryptanalytic headquarters at Bletchley Park.
- After the war he researched on *How brains grow new connections*. The out-coming paper *The Chemical Basis of Morphogenesis* was foundation of modern non-linear dynamical theory and was the first step into Artificial Life and Intelligence.
- He also created the **Turing Test** in 1950 which should test if an Artificial Intelligence consists of a thinking power equal the human ones. Until today only one supercomputer passed the Turing Test successfully. [3]

3 Donald Knuth

3.1 About Knuth

Donald Ervin Knuth was born on January 10th, 1938 in Milwaukee and is another very important person in modern Computational Logic, especially in analysing algorithms. He is a retired Professor at Stanford University who got numerous prizes for his research results, culminating in being awarded the **Turing Award** in 1974 for his work on analysing algorithms and on design of Programming Languages. Knuth received his Ph.D. in 1963 by the California Institute of Technology. In 1964 he already got internationally known and recognized for his idea of an Input/Output system for the programming language ALGOL 60. [5] In 1968 he got Professor for Informatics at Stanford University where he researched, taught and worked until his retirement 1993. Today he is holding lectures from time to time, but not on a regularly base.

“Don” Knuth is a perfectionist. Everything he does has to be perfect to satisfy him. That is why he spends so much time on creating T_EX or his must successful work *The Art of Computer Programming*. A fun fact is that if you find an error in his books you get paid \$2.56 which corresponds to \$1.00 in hexadecimal. In one of his famous *All Questions Answered* lectures at the TU Munich 2002 Knuth made some very important statements of which we should think of. He mentioned that the design of efficient algorithms was the core of computer science and also that he saw an almost infinite horizon for the need for efficient algorithms. [6] With his ideas and tremendous work he really had and has a lot of influence on Computational Logic and Informatics and they would not be as they are now without Donald Knuth.

3.2 Some of Knuth’s famous works

- The Art of Computer Programming
- T_EX and METAFONT
- MMIXware

4 C.A.R. (Tony) Hoare

4.1 The life of Tony Hoare

Sir Charles Antony Richard Hoare was born on January 11th, 1934 in Colombo. In 1960 he implemented ALGOL 60 for the Elliot Brothers company and got Professor of Informatics at Oxford University in 1977. He was interested in mathematical logic from which he thought it would be the basis of the formal treatment of computer programming. Hoare was awarded the Turing Award in 1980 and received lots of other prizes until now. Today he is retired Professor and leading researcher for Microsoft Research in Cambridge where he tries to acquire his lifetime goal of verification of computer programs.

4.2 Hoare's most successful works

- Hoare calculus: allows to prove the correctness of software (software verification)
- The Quicksort algorithm: a often used sorting algorithm from which Hoare himself thought that it has been the only really interesting algorithm that he had ever developed. [8]
- Communicating Sequential Processes (CSP): a process algebra which influenced the programming languages Ada, Occam and Go.

5 Leslie Lamport

Leslie B. Lamport, born on February 7th, 1941 in New York, is a well-known and famous scientist in the field of Maths, Informatics and Programming. Mainly in Theoretical Informatics and Computational Logic he did a lot of research which was important for modern computer science. He received his Ph.D. in Maths at Brandeis University in 1972 for his dissertation about *The Analytic Cauchy Problem with Singular Data* [10]. Diverse employments followed. Lamport was honoured lots of prizes, in particular with the **Turing Award** 2013 for his work on *fundamental contributions to the theory and practice of distributed and concurrent systems*. Today Lamport works for Microsoft Research and continues his research.

5.1 Some of Lamport's works

Leslie Lamport wrote 179 papers until today. [9] Here are some of them short described:

- \LaTeX : On base of Knuth's \TeX Lamport developed "Lamport TeX" in short \LaTeX which made the use of \TeX easier by providing macros.
- Lamport-Diffie One-Time Signature Scheme: A method to construct digital signatures
- Fundamental contributions to the theory and practice of distributed and concurrent systems

6 Conclusion

Many brilliant people worked and researched nearly their whole life to find answers to essential questions of Computational Logic. This paper covered some important persons who played a major role on building the foundation of modern computer science and who brought it to the high level it is today. Of course there are a lot of people who did affect the development of Computational Logic and Theoretical Informatics too, but to cover them all would go beyond the scope of this document. In conclusion it can be said that we have by far not discovered all secrets of Computational Logic yet and it can be hoped that many brilliant people will come to take the legacy of the famous ancestors and carry it to new dimensions.

References

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