# The Biography of Donald Knuth

# Image result for Donald e knuth**WHO IS DONALD KNUTH?**

# “Father of the analysis of algorithms”

Donald Ervin Knuth was born on the 10th of January 1938 in Milwaukee, Wisconsin.

He is a renowned computer scientist, mathematician and professor emeritus at Stanford University. From an early age Donald proved to be a rather gifted child.

As a student of Lutheran High School, Donald was awarded several academic accolades, due to his problem-solving capabilities. (Shasha and Lazere, 1998)

After winning a Westinghouse Talent Search scholarship, Knuth went on to study physics at Case Institute of Technology (Frana, 2017). Whilst attending,

Knuth joined Beta Nu Chapter of the Theta Chi fraternity and became one of

the founding editors of the “Engineering and Science Review”. (Greeklife.case.edu, 2017)

Knuth proved to be an exemplary student there also. When introduced to the

# FUN FACT

In eighth grade, Donald entered a contest to find the number of words that the letters in "Ziegler's Giant Bar" could be rearranged to create. Although the judges (“Ziegler’s master list”) only had 2,500 words, Donald found 4,500, winning the contest. As prizes, the school received a new television and enough candy bars for all his schoolmates to eat.

IBM 650 Magnetic Drum Data-Processing Machine and after reading it’s manual,

Knuth believe he could do better and decided to rewrite the assembly and

compiler code for the machine used in his college.

Knuth switched major from physics to Mathematics and given his exceptionally

outstanding work, he received his bachelor of science degree as well

as his master of science degree. (Koshy, 2004) (Walden, 2017)

In 1963, Knuth earned his PhD mathematics from the California Institute of

Technology under the advisory of the great mathematician Marshall Hall.

# **CONTRIBUTIONS TO COMPUTER SCIENCE**

## “An algorithm must be seen to be believed.”

* Vol. I, Fundamental Algorithms, Section 1.1 (1968)

After receiving his PhD Knuth joined Caltech’s faculty as an associate professor.

Here, he began to write a book on computer programming language compilers.

However, Knuth was frustrated that with despite so much discovery in the field

there was no one useful source of what was known. Knuth realised the need for

*“someone to get down all the good ideas that had been published and that we*

*were already forgetting”* and so came the birth of

*“The Art of Computer Programming”*. (Bcs.org, 2017)

Knuth felt he was the perfect candidate to write such a book as he was the only guy

he knew who hadn’t invented anything himself, he could deliver an unbiased and

neutral approach and act as a “spokesman for the other people”. (Bcs.org, 2017)

“The Art of Computer Programming” is a multi-volume textbook that illustrates

the rigorous analysis of the computational complexity of algorithms and

systematised formal mathematical techniques for it. (CS-Stanford1., 2017)

In 1999, the textbooks were named among the best twelve physical-science monographs of the century by American Scientist (Bcs.org, 2017). The texts are extremely complex and difficult, even Bill Gates has praised its difficulty stating *"If you think you're a really good programmer… read (Knuth's) Art of Computer Programming… You should definitely send me a résumé if you can read the whole thing."* (Weinberger, 2017)

Other contributions to the computer science community include the development of parsing that is used in algebraic compilers to this day. Knuth developed this theory which underlies algebraic languages and it wasn’t until through writing chapter ten of “The Art of Computing” book, that combining the knowledge and theories of others, he was able to bring them together and develop the theory of parsing. (Bcs.org, 2017)

Knuth feels his greatest contribution to computer science was his mathematical approach to compare algorithms to discover how good a method was. He worked out quantitative ways to measure which programs were better than others and the mathematical approach that carries along with it and ultimately is referred to as analysis of algorithms. *“It’s what I’m most proud of - in developing an academic subject, but it’s key to the successful use of the machine”.* (Bcs.org, 2017)

Knuth also incorporated his religious beliefs into his texts of computer science and he wrote another book titled “Things a Computer Scientist Rarely Talks About”. The book contains the annotated transcripts of six public lectures given by Knuth based upon the subject of relations between religion and computer science.(CS-Stanford2, 2017)

Knuth is the author of the mathematical novelette called Surreal Numbers. It is based upon English mathematician, John Conway’s, set theory construction of an alternate system of numbers. In this book, Knuth shows the developments of the mathematics and not just a simple explanation he wanted *``to teach how one might go about developing such a theory.”*

(CS-Standford3,2017)

Knuth was also the creator of TeX computer typesetting system in 1978. The goal of TeX was to allow anybody to produce high-quality books using minimal effort, and to provide a system that would give the same results on all computers, at any point in time. (Gaudeul, 2017)

Knuth also was the developer of METAFONT which is a description language used to defined vector fonts, this was devised as a counterpart to TeX. (Knuth, 1986)

# **AWARDS & HONORS**

Donald Knuth has received multiple awards for his academic contributions over the course of his scientific career.

## 1970’s

In 1971, he received the first ACM Grace Hopper Award and not long after was awarded the notable Turing Award in 1974 for the development of *“The Art of Computer Programming*”.

He received the Lester R. Ford Award in 1975. The Josiah Willard Gibbs Lecturer award in 1978 and the National Medal of Science in 1979.

## 1980’s & 1990’s

In 1988 he received the Franklin Medal. In 1995 he was awarded two different awards, the John von Neumann Medal and the Harvey Prize form the Technion and in 1996, he was awarded the Kyoto prize. In 1988 he was elected as a fellow of the Computer History Museum.

## 2000’s

In 2009, Knuth was elected as a Fellow of the Society for Industrial and Applied Mathematics for his outstanding contributions. He received the Katayanagi Prize in 2010 and the BBVA Foundation Frontiers of Knowledge Award. He was honoured with delivering the Turing lecture in 2011 and received the Stanford University School of Engineering Hero Award.

(O'Connor and Robertson, 2017)

# **OTHER FACTS**

Knuth was familiar with making mistakes too, and used to pay a finder’s fee of one hexadecimal of a dollar ($2.56) for each typographical error or mistake discovered in his books. However, in 2008 he had to stop sending reals cheques due to bank fraud and now error finders receive a “certificate of deposit”. (Ditlea, 2017)

In 2006, Knuth was diagnosed with prostate cancer and underwent surgery as well as some radiation therapy, all of which went successfully (Webofstories.com, 2017).

*“In retirement, Knuth still writes several programs a week. He no longer advises students, but he hosts free public Computer Musings talks several times a year, drops in on graduate-level courses occasionally, and bikes to campus most days of the week to use the libraries or swim at the aquatic centre.”*

(Platoni, 2017)

This is the life of Donald E Knuth.

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