

Biography of Donald E. Knuth

Donald Knuth is one of the most accomplished living pioneers of computer science. He is especially recognized for developing the subdomain of computer science known as analysis of algorithms. His other contributions to the field of computing include creating popular software systems, such as the typesetting system TeX, as well as authoring some of the field's most essential and popular works.

In light of these accomplishments, it is notable that Knuth had little exposure to computers until he attended university to study physics. Growing up in computers' early days in the '40s and '50s, Knuth had instead directed his intellectual curiosity towards music and mathematics. However, his rare intelligence ensured that his first encounter with computers established a lasting affinity. In college he quickly learned to program using a university machine and even single-handedly rewrote its compiler to improve its function.^[1]

Knuth soon developed a professional and academic reputation as a skilled computer scientist, mathematician, and writer. He became especially proficient at developing compilers. In the process of writing a book on the specific subject of compilers, Knuth determined that the relatively young and unorganized discipline of computer science demanded a thorough explanation of its fundamental ideas. In 1962, at the age of 24, he began writing *The Art of Computer Programming*. This project, commonly known by the abbreviation *TAOCP*, has since expanded into a comprehensive series of computer science volumes whose final installments are still emerging today.^[2]

The *TAOCP* books and their ideas have been credited with underpinning the academic study of analysis of algorithms. Knuth himself actually originated the term "analysis of algorithms." Indeed, of all his many achievements Knuth has professed to be proudest of establishing this field as an integral component of computer science, such that it is incorporated into most formal computer science education and research today. The *TAOCP* books emphasize the mathematical aspects of programming algorithms, such as their asymptotic complexities. In doing so they utilize asymptotic notation and other techniques that have become typical of algorithms research and development since the early volumes' publications decades ago.^[3]

In addition to the massive influence of his book series, Knuth is credited with many specific contributions to the study of algorithms. One notable algorithm originated by Knuth along with a student is the so-called Knuth-Bendix completion algorithm, which addresses the word problem in algebraic systems.^[2] Given a set of relations or equations, the algorithm derives consequences in order to produce a complete set. As mentioned above, Knuth also developed typesetting tools, such as TeX, which revolutionized not only the visual expression and communication of algorithms and mathematics but also that of popular printed works.^[4]

Knuth's designations of TeX and other software projects as free demonstrate his principled commitment to advancing knowledge and wellbeing through computing. These motivations have also driven Knuth to publicly oppose the encroachment of patent law into the domain of software, which he perceives as a transgression against spreading human knowledge.^[4]

In 1974 Knuth received the Turing Award, particularly for his launching the study of analysis of algorithms through his popular book series.^[2] Knuth has received a host of other accolades for his work. Knuth continues to contribute to the field of computer science to this day. In December of 2015 at age 77 he recently published his most recent addition to *The Art of Computer Programming*. He plans for more books to follow.^[3]

Bibliography

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