

The EATCS Award 2015 is awarded to

Christos Papadimitriou

for his visionary and pioneering contributions to the development of Computer Science and its connections to the physical and applied sciences.

Prof Christos H. Papadimitriou (henceforth Christos) had the most fundamental effect on the shape of several, major research areas within Theoretical Computer Science. He is an intellectual giant interested in the fundamental problems of many scientific disciplines and their computational origins, he was able throughout his exceptional career to draw connections between areas at the highest and deepest intellectual level. His work is characterised by opening new research directions, defining new models, asking fundamental questions, and developing sophisticated techniques to deal with such problems.

Christos had been a central contributor to the fields of *algorithms and complexity*. His most influential work therein concerns the complexity of approximation problems. The question of understanding which decision problems in NP can be computed in polynomial time and which are NP-complete had become an elegant theory by the late nineteen eighties. But after much effort the analogous question of having a similar theory for approximation problems was still wide open. At this time Christos (with Yannakakis) defined the class *MaxSNP*, which turned out to be key to the discovery of probabilistically checkable proofs and, finally, helped place inapproximability problems within the classical NP theory. A second line of his pivotal contributions is establishing the complexity theory of local search. It appeared that complexity classes of total functions PLS, PAD, PPAD defined by Christos are key to understanding the computational power of fundamental mathematical principles and are deeply related to proof complexity.

Christos has been a towering influence on *algorithmic economics*, the important and growing field at the interface between Economics and Computer Science. His influence on the economics of the Internet, and on the way classical concepts in economics should be viewed when agents are computationally bounded, cannot be overestimated. Among his many results his work (with Koutsoupias) on the “*price of anarchy*” has been enormously influential. Perhaps his most striking single contribution in the area was establishing (with Daskalakis and Goldberg) the completeness of

the Nash equilibrium problem in the class PPAD.

Christos contributed numerous important results to *Operations Research*. They include general efficient treatment of multi-objective criteria, new approximation algorithms to NP-complete problems such as the Traveling Salesman Problem, and an ingenious way to solve linear programs with exponentially many constraints.

Although we cannot hope to make justice to the whole of his research here, let us mention his many contributions to *Database theory*, in particular on efficient implementations of different queries to databases, and to *Online algorithms*, where he solved the hottest, long standing problem of this field at the time: the k-server conjecture.

As an ambassador of computer science to other fields, Christos took on the queen of problems of *Evolutionary Biology*, namely, the problem of sex. To date, no satisfactory explanation exists for the nearly universal prevalence of sexual reproduction, whereas it seems that asexual reproduction better supports Darwin's theory of maximising fitness. In highly original work, Christos and his collaborators suggest a new "mixability theory" which argues that sexual reproduction drives a different survival advantage, viz., the ability of alleles to thrive in a variety of genetic contexts.

Christos's work has been of consistently high quality for over 30 years. His books and papers transformed the way people thought about their research, providing fresh insight, research direction or powerful technique. He has provided the field with some excellent textbooks, e.g., on Algorithms, Complexity, Optimisation and Database theory, and has a very strong record of mentorship to young scientists. His expository work through his novel "Turing" and the fascinating "Logicomix" completes his profile as a true "*Renaissance man*" of Computer Science.

For all these reasons, the EATCS wants to celebrate Prof. Christos H. Papadimitriou, his technical brilliance, inspirational figure, wide reaching and profoundly impactful work, and is honoured to award him with its most prestigious prize.

Fedor V. Fomin, Kim Larsen, Vladimiro Sassone