

# Camilla Hollanti

THE FINNISH ACADEMY of Science and Letters awarded one of its Väisälä Prizes for 2017 to Professor Camilla Hollanti. Professor Hollanti gained a doctorate from the University of Turku in 2009 with a thesis on applications of algebraic number theory to wireless communications. She was then appointed professor of mathematics in the Aalto University's Department of Mathematics and Systems Analysis. For the years 2017–2018 she has been a visiting researcher at the Technical University of Munich, Germany.

"It has been wonderful to get back to doing research of my own after a long time away," she points out with gratitude, "In Finland the majority of my time goes on administration and supervising my research team." This team is engaged in studying algebra, number theory, combinatorics, coding theory and information theory and the applications of these to wireless communications, distributed cloud storage and self-correcting codes.

This work is of significance both scientifically and in practical terms within society.

"Recently we have been concentrating in particular on efficient ways to ensure privacy for people searching for information. This is becoming increasingly important with the extending possibilities for using and benefitting from computer networks."

"I am mostly engaged in basic research, but it is research that has great opportunities for applications. As a scientist, however, I don't usually take a stand as to how my results are applied at the device or protocol level. I leave that work to other people," Hollanti says.

"Although the connections with practical applications are obvious, results of basic research are taken up in practice relatively slowly. The solutions reached are affected by many other factors in addition to the information provided by basic research: it is necessary to trace out the routes by which it is possible to proceed and search for the constraints."

*Professor Camilla Hollanti's work is of significance both scientifically and in practical terms within society*



The methods that have been developed so far can be used for improving the efficiency, reliability and security of data transmission and the durability of data storage. Recent research has been connected with the security of the physical dimension, for instance; that is the degree of security that can be achieved without encrypting or in addition to it, independently of the computational capacity of the intruder.

"It is a question of the fact that wireless communication channels incorporate a degree of natural randomness on account of noise or attenuation of the signal. Our protection methods are connected precisely with exploitation of this randomness, as it offers an easy and inexpensive means of increasing the security of communications."

"The amount of information contained in computer networks is increasing all the time, and the new 5G networks and the Internet of Things will revolutionize the lives of quite ordinary people, as the

growth in network transmission capacity will mean that many things will be done in entirely new ways. Also, as the networks become denser it will become possible to transmit on millimetre wavelengths, which will make massive systems of aerials an everyday phenomenon."

"The future will be great fun. Our whole concept of being present in situations and being in contact with others will alter. But there will also be dangers, the greatest of which will presumably concern the protection of networks from attacks and hijackings. An attack on the lighting system of a home, for example, could in principle threaten the safety of the whole network to which the house's system belongs. As far as our ongoing research is concerned, questions of personal privacy are also likely to increase in importance," Hollanti points out.

Camilla Hollanti has been involved in the writing of more than 90 peer-reviewed scientific papers and has supervised the work for nine doctoral theses, some of

which are still to be completed. She has also been leader of a number of Academy of Finland projects. She has an extensive net-

work of international contacts and has been an invited speaker at several international conferences.

*Väisälä Prize is awarded annually to 1–3 already distinguished scientists in the active parts of their careers.*